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ABSTRACT

This publication presents a series of field-proven school energy conservation, management, maintenance, and operations practices and ideas. Also included are the names, addresses, and phone numbers of individuals and organizations to contact for more detailed information. The brief summaries are grouped into six sections. "Planning and Managing Energy Conservation Programs" focuses on the human aspect of energy management and presents descriptions of districtwide conservation programs. "Managing Facilities Costs and Resources" deals with methods and procedures for training staff and redirecting resources. "Building Design and Management" highlights information about the building, the building envelope, and design features to reduce energy consumption and enhance operation. "Custodial and Housekeeping Programs" presents several programs to improve day-to-day cleaning operations. "Computerized Programs" includes computer-based activities at different levels of sophistication to conserve energy, reduce manpower requirements, and monitor other aspects of school building management and operations. "Energy Conservation in Pupil Transportation" highlights energy management and alternatives to gasoline. (MLF)

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School Facilities Maintenance and Operations

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School Facilities Maintenance and Operations

As presented during Special Sessions on Energy Management and Maintenance and Operations at the 67th Annual Meeting and Exhibits of the Association of School Business Officials of the United States and Canada, October 12, 1981, in Kansas City, Missouri.

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PREFACE

THE basic, underlying professional objective of the Research Corporation of the Association of School Business Officials (RC-ASBO) is to identify and share timely, appropriate information about successful school business management programs and practices. This publication is just one example of how RC-ASBO programs meet that objective. It presents a series of field-proven school energy conservation, energy management and maintenance and operations programs, practices, procedures and ideas that can assist educators grapple with the resource allocation challenges of the 1980s.

In addition to sharing valuable energy conservation, energy management and maintenance and operations ideas and proven techniques, the programs presented in this book provide a resource listing of the names, addresses and phone numbers of the individuals and organizations who are willing to share greater details about their respective programs and ideas with other educators.

Charles G. Stolberg
Associate Executive Director
Research Services

INTRODUCTION AND ACKNOWLEDGEMENTS

DURING its 67th Annual Meeting and Exhibits in Kansas City, Missouri, October 11-15, 1981, the Association of School Business Officials of the United States and Canada presented two Special Sessions: one on energy management and conservation and the other on maintenance and operations. Each of these 90-minute educational programs presented a series of mini-workshops. Each featured a successful, field-proven practice, method or technique to improve school energy management or maintenance and operations programs.

The presenters at these mini-workshops were school administrators and others extremely knowledgeable about energy management and maintenance and operations programs. Each presenter's school district or organization had developed and implemented a successful program to improve school district facilities management programs.

During these Special Sessions, each presenter described his organization's exemplary program which provided the basis for a brief written summary -- a "Tip Sheet" -- that was included in a "Gold Mine" packet distributed to everyone in attendance at each Special Session.

The material presented in this book is based on those tip sheets and the supporting materials submitted to the Association when each school district applied for participation in the program.

For ease of reference and use, the materials presented during both of the 1981 Special Sessions have been grouped into these sections:

Section I -- "Planning and Managing Energy Conservation Programs" which focuses on the 'people aspect' of energy management and presents descriptions of district-wide conservation programs.

Section II -- "Managing Facilities Costs and Resources" presents summaries of the mini-workshops that dealt with methods and procedures for training staff and redirecting resources.

Section III -- "Building Design and Management" highlights information about the building, the building envelope and design features to reduce energy consumption and enhance facilities operations.

Section IV -- "Custodial and Housekeeping Programs" presents several programs to improve day-to-day cleaning operations.

Section V -- "Computerized Programs" includes computer-based activities at different levels of sophistication to conserve energy reduce manpower requirements and monitor other aspects of school building management and operations.

Section VI -- "Energy Conservation in Pupil Transportation" highlights programs to reduce energy consumption in transporting schools between home and school.

ASBO acknowledges the contributions made by these presenters and by those within the presenters' respective school districts to the success of both of the Special Sessions whose diligent work and dedication were responsible for developing and implementing the programs described on the following pages. All participants have agreed to have the material presented during the Special Sessions included in this ASBO publication so that their experiences can be shared with other school administrators across the United States and Canada.

Session Leader for both programs was Arthur Bourassa, Secretary-Treasurer, School District 62 (Sooke), Victoria, British Columbia, Canada; and Chairman of ASBO's Maintenance and Operations Research Committee.

Session Coordinator for both programs was Paul C. Bisel, Director of Facilities and Planning, Weld County School District #6, Greeley, Colorado; and Vice Chairman of Program of ASBO's Maintenance and Operations Research Committee.

Participants were:

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* Dr. Wilton Anderson, Director, Energy and Education Action Center, U.S. Department of Education, Washington, D.C.

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* Frank Barzilla, Director of Facilities and Planning, Clear Creek Independent School District, League City, Texas.

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School Facilities Maintenance and Operations

PLANNING AND MANAGING ENERGY CONSERVATION PROGRAMS

A TEAM APPROACH TO MANAGING YOUR SCHOOL'S ENERGY DOLLAR (OR ENERGIZING FOR ACTION THROUGH PREVENTIVE/CORRECTIVE MAINTENANCE AND OPERATIONS)

As presented by:

Dr. Wilton Anderson
Director, Energy and Education Action Center
U.S. Department of Education
Donohoe Building, Room 1651
400 Maryland Avenue, S.W.
Washington, DC 20202
Phone: 202/472-7777

ESTABLISHING an energy management team -- who can help you?

At the district level: One individual should be in charge of coordinating your district-wide program and monitoring consumption and costs. This person should work with the leader of each facility's Energy Management Team at regular meetings and be responsible to the superintendent.

At the building level: Your Building Team should be composed of the following individuals and they should select a leader: principal; teacher; operations/maintenance supervisor; support staff representatives; food and/or transportation supervisor; parent representative of Parent, Teacher, Student Organization; and student body representative.

Beginning Your Program -- How Can You Motivate Your Staff?

The district energy coordinator should design a special training workshop for the Energy Management Team. Then, specific tasks should be assigned to specific individuals. These tasks should include:

* Assessing the current level of interest in energy conservation of the faculty, staff and students with a brief survey form, meetings or individual contacts.

* Scheduling brief, yet informative faculty meetings, PTSA and assembly programs to stimulate interest and awareness of the need for energy conservation in the Nation -- and in your

schools. Make sure your programs are presented in a concise and dynamic manner.

Utilize one-day inservice meetings as ongoing energy conservation training programs, designed and implemented by the Energy Management Team, for the entire faculty and building support staff. Use these inservice opportunities to maintain a high level of commitment and enthusiasm.

Establish a committee composed of interested teachers and led by a representative of the Energy Management Team. Determine what energy topics are currently being taught and collect other energy education materials for possible introduction into the curriculum.

Establish Baseline Data -- How Much Are You Saving?

Analyze utility bills, charting fuel and electricity consumption separately (be sure to include demand readings) and a common energy unit such as the BTU. Data charts can be designed by a member of the Team, or obtained from your State Energy Office. Use graphical representations to display previous, current and projected energy costs at meetings of staff and parents. Obtain degree-day data from your utility or weather bureau to compare months of successive years and to forecast future consumption. Inform your local utility of your program and ask to work with your representative to reassess your school's rate structure, to learn how electrical demand influences your costs and other ways the utility can help you sustain your program.

Communicate Your Team's Decisions -- What Should be Expected?

Organize the Team's decisions according to the building's eight energy using systems: human, envelope, lighting, heating, cooling, ventilation, water and special. Utilize special inservices, meetings, workshops and/or assembly programs to inform everyone of the Team's decisions. Explain how various groups or individuals will be involved in your school's comprehensive energy conservation program. For example, have individuals explain:

* How energy concepts will be infused into the traditional curriculum of each discipline (utilize work of the Faculty Energy Education Committee);

* How the student body will be actively involved in promoting energy conservation;

* How consumption will be reduced in high energy waste areas;

* How the parent-teacher-student organization will be involved; and

* How consumption will be reduced in the building's energy using systems.

Monitor Your Consumption.

Your Energy Management Team should continue to:

* Record consumption of fuels, including electrical demand, for each billing period.

* Compare current consumption with baseline and degree-day data.

* Conduct walk-through energy audits for each season and during times in which the building is occupied and unoccupied.

* Determine energy and dollar savings or extra costs.

* Communicate results with attractive posters, charts and memos.

* Encourage total program involvement.

Evaluate Your Program.

Your Energy Management Team should:

* Determine whether your goal has been achieved for each billing period.

* Identify strong and weak points of the program.

* Modify procedures to increase program effectiveness, motivation and involvement.

* Inform everyone of the proposed programmatic changes.

* Renew commitment to the program.

Identify Major Areas Of Consumption -- Where Have All the BTU's Gone?

Conduct a walk-through energy audit of your building -- inside and outside -- utilizing the Energy Management Team. Energy audit forms can be obtained from the U.S. Department of Energy or your State Energy Office. (If your district is participating in the Federal Institutional Building Energy Grants Program, be sure the audit forms you select are in compliance with State and Federal regulations.)

Although not critical to the outcome of the audit, two inexpensive devices -- a light meter and thermometer -- can be especially helpful to the Team. When the audit has been completed, it is important for the Team to "debrief," consolidating data and discussing the findings. Areas of high consumption and energy waste should be identified. The Team should give special consideration to:

* Reducing excessive fresh air in ventilation systems;

* Matching heating and cooling hours with actual operation schedules, using temperature setbacks when building has limited occupation;

* Programming operations to avoid high electrical demand charges;

* Substituting lower wattage tubes which can save up to 14 percent and reduce air conditioning loads;

* Examining vestibule doors for proper functioning to avoid heating/cooling losses;

* Implementing workshops/seminars to illustrate how illumination can be reduced but still be effective;

* Checking outside lighting to be sure it is in phase with natural lighting and operation schedules;

* Inspecting mechanical equipment periodically for proper functioning (frequent thermostat readjustment can be an indicator of malfunctioning equipment);

* Lowering thermostat settings during the air conditioning season (setting at 78° F instead of 72° F is approximately a 25 percent savings);

* Adjusting custodial hours to coincide with good energy management;

* Utilizing any available natural lighting;

* Questioning the need for and the operating hours of some exhaust fans (often fans are discovered to be operating in reverse);

* Examining motors for proper maintenance and efficient operation;

* Cleaning lighting and mechanical equipment; and

* Examining delivery areas for possible heating or cooling loss.

Inform the faculty, staff and student body of major findings with memoranda, signs and/or posters.

Decide Appropriate Operational/Maintenance (O&M) -- What Inexpensive Options Does the Team Recommend?

Many energy audit forms contain an audit "checklist." Some (Making Cents of Your Energy Dollar, Schoolhouse Energy Efficiency Demonstration (SEED) Project) combine the checklist with appropriate O&M and ECM (Energy Conservation Measures; retrofit and redesign) options. The former can usually be implemented quickly utilizing building or district personnel; the latter requires special expertise

and/or equipment.

Implementation of specific O&M's should be assigned to specific individuals who are given specific deadlines. Remember: An effective program requires the involvement of all concerned. DECIDE APPROPRIATE ENERGY CONSERVATION MEASURES (ECM's) -- What options requiring major capital outlay does the Team recommend for consideration? Use the simple payback equation to rank ECM's. Those yielding the most rapid payback period (1-5 years) should be implemented first. Remember: Simple Payback does NOT take into account escalating energy costs and product cost inflation.

$$\text{SIMPLE PAYBACK} = \frac{\text{Estimated implementation cost}}{\text{Estimated first year dollar savings}}$$

PEOPLE INVOLVEMENT IN ENERGY CONSERVATION

As presented by:

Clarence O. Britton
Director
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"BUILDINGS Don't Use Energy - People Do!"

This saying has great validity. It has been estimated that modifying the behavioral patterns (teaching the "Energy Ethic") of people can reduce consumption of energy by 15 to 25 percent. Any energy conservation plan that ignores the human element will utimately result in failure.

The human element plays such a significant part in energy conservation that it should be thoroughly established in your program first. People (staff, students, operations personnel and parents) need to know what is expected of them and the results of their participation. Communications must be concise and consistent. Follow-through must be provided. People involve themselves only to the degree that their involvement matters.

People involvement works best through a team approach. Involvement must have positive rewards and offer personal satisfaction. The team should take the conservation concept and develop a district plan which must reach each building of the system. Team members should provide leadership in each building. The plan developed by the team must include:

1) Established goals, strategies and timelines.

   a) The goal should be realistic and not frustrate or discourage involvement.

   b) The goal should be translated into energy units (BTUs) to reflect actual savings.

   c) The "cost avoidance" reflected from energy savings should become a valuable incentive.

   d) The "Energy Ethic" should be made part of the ongoing program.

   e) No-cost or low-cost items should become top priority consideration of the program.

2) The team should create a communication's network. Communications should:

   a) Be issued in the form of regular reminders and updates.

   b) Inform staff and students of the importance of meeting the program's goals.

   c) Be both oral and written.

   d) Include data that substantiates anticipated objectives.

   e) Be positive, concise and non-threatening.

3) Energy awareness programs for the staff and students.

4) Training programs for custodial and maintenance personnel.

5) Evaluation of goals and projected energy measures.

   a) Determine whether your goal has been achieved.

   b) Determine strong and weak points of the program and modify if necessary.

   c) Redirect projections and goals if necessary and inform team members of changes.

   d) Continually renew the commitment to the program.

6) Involvement of expertise from business and community -- use available personnel and information to strengthen the base from which you work.

Here is a five-point list to help in recognizing potential energy

saving actions:

1) "Tune it up" -- make it run better on less.

2) "Turn it down" -- don't require so much of it.

3) "Turn it off" -- don't use it when it's not needed.

4) "Turn it around" -- take a poor unit or system and fix it so it does more for less.

5) "Throw it away" -- if it's a dog and can't be fixed, start over.

USING CREATIVITY IN PLACE OF DOLLARS IN YOUR SCHOOL DISTRICT'S ENERGY MANAGEMENT PROGRAM

As presented by:

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131 West Broad Street
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Phone: 716/325-4560

DO you wish you had some better techniques to stimulate interest in conservation because you aren't really reaching the troops right now? Have you problems with getting all that good data into a form that means something to boards, principals, teachers and/or custodians?

Everybody agrees that energy conservation is important in schools today because climbing costs will cut drastically into educational programs if we can't conserve now. So although we would have liked to have hired an energy engineer and purchase an energy management system -- what we ended up doing was applying a little creativity to our problems and spending considerably less money.

We purchased a small, inexpensive desk-top computer, a Hewlett Packard 85, which stores our energy usage data and prints in out in graphs. This gives us a visual comparison of how each building did in electricity and heating fuel, comparing the current year's usage with the previous year's and a base year. Graphs are run quarterly.

This provides a rapid feedback system to show principals and custodians how their conservation efforts are progressing. It provides administration with tools to identify buildings needing additional help. And it identifies those buildings performing well in

energy management.

From those buildings, a team of custodian-engineers with proven energy expertise was organized. They assist their peers with energy problems. They identify new energy projects that can be applied throughout the district; and they provide communication to central administration on good conservation techniques in the schools.

We located sources outside the district which provided us with dollars for conservation projects which we otherwise couldn't afford. We received a grant from a local corporation which funded a team of CETA summer youth employees that delamped over 13,000 fluorescent tubes after performing lighting audits. Expected savings should run over $170,000 annually with no cost to us.

ENERGY MANAGEMENT/MAXIMUM BENEFIT - MINIMUM COST

As presented by:

Thomas Cooper
Educational Facilities Planning Consultant
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HOW is your school doing with its energy management program? You have probably been involved in energy conservation activities and have seen some positive results of your efforts. You may be somewhat dismayed, however, as you find yourself spending more energy dollars even though you have had a considerable reduction in your energy consumption.

Did your district develop an energy management plan? A number of state and national programs exist that suggest step-by-step energy management programs. Many have been tested and work well. A common element in each management program is the commitment to the establishment of an Energy Management Plan. The major emphasis of this presentation is to share some guidelines for developing such an energy plan. It is contended that a good plan can be developed at a "minimum cost" and can lead to a "maximum benefit". Come and compare your management plan.

Plans are worthless unless implemented -- some practical plan implementation strategies are these:

- Board of Education Commitment
- Administrative Commitment
- Plugging in the Participants
- "Unplugging" Others
- Program Monitoring

- The Energy "Czar"
- Communications/Public Relations
- Outcomes/Evaluations
- Spinoffs
  - -In-service education (faculty/staff)
  - -Student awareness
  - -Community awareness/acceptance
- Social Responsibility
- Other

MANAGING YOUR SCHOOL'S ENERGY DOLLAR

(OR DON'T LET ENERGY CONSERVATION

RESULT IN CURTAILMENT OF EDUCATIONAL SERVICES)

As presented by:

Dr. Wilton Anderson
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WHY You Shouldn't "Write Off" the Rising Costs of Energy -- Because sky-rocketing energy costs are consuming a disproportionate share of your budget; because this can diminish the effectiveness of your educational programs; because a weakened educational system threatens our democratic system; and, because, as an educator, you care.

TYPICAL ENERGY DOLLAR FOR EDUCATIONAL INSTITUTIONS*:

(*Adapted from NTIS circular HCP/M5250-01/1)

Heating/Ventilation/Air Conditioning	$.65
Lighting/Special Educational Equipment	.25
Food Services	.07
Hot Water	.03

THE VALUE OF SCHOOLHOUSE ENERGY MANAGEMENT

It has long been believed and was recently confirmed by an independent study that schools can reduce their energy usage by almost 50 percent with the implementation of a total energy management program. The greatest cost avoidance occurs in heating fuels (over 60 percent); the remainder in electricity. And, according to that same study, the average payback for selected energy conservation investments is less than one year!

WHO CAN HELP YOU MINIMIZE THE ENERGY "BITE" ON YOUR BUDGET?

YOUR energy management team...YOUR local administrators...YOUR faculty...YOUR operations/maintenance personnel...YOUR support staff ...YOUR students...and THEIR parents because THEY care, too!

AN EFFECTIVE PLAN OF ACTION REQUIRES:

1) An Achievable Goal -- Providing for Accountability;

2) Communication -- Motivating for involvement;

3) Action -- Giving Assignments;

4) Monitoring -- Collecting Data; and,

5) Evaluation -- Passing the Course...with an infusion of energy concepts into the curriculum.

SET AN ACHIEVABLE GOAL -- YOUR GOAL SHOULD BE:

* Realistic and should not frustrate or discourage involvement. Initially, try for a 10 or 15 percent reduction in energy consumption.

* Translated into energy units such as BTUs, cubic feet of natural gas, kilowatt hours of electricity -- not dollars -- to reflect actual savings.

* Associated with the elimination of the habit of waste.

* Related to no-cost or low-cost operational and maintenance opportunities.

EXAMPLE

ENERGY CONSERVATION GOAL

Our school has established an energy management goal of reducing annual energy consumption by 10 percent by increasing the efficiency of our energy usage. We need everyone's help.

ESTABLISH AND MAINTAIN COMMUNICATION -- EFFECTIVE COMMUNICATION SHOULD:

* Inform staff and students of the importance of the goal; it should also be targeted to parents and community organizations.

* Originate with the energy management team and be issued in the form of reminders and updates on a regular basis.

* Be both oral and written; graphic and artistic displays should be utilized to gain and maintain momentum and enthusiasm.

* Include data collected by the energy management team and should illustrate anticipated objectives.

* Always be positive, concise and non-threatening.

* Reflect the program's status.

ENERGY MANAGEMENT DECISIONS AND METHODS

As presented by:

Frank Barzilla
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Clear Creek Independent School District
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IN order to look at any effective means of saving energy in a school district, that district must be prepared to make some difficult decisions. Once those hurdles are crossed, the tools and/or methods that will work are many and varied.

This report will discuss both the decisions and the tools that will work: If you think the efforts are not worth the return, picture your utility bills doubled by 1987 and re-doubled again within 10 years. Considering only those numbers, one person being responsible for saving 10 percent of a school district's energy bills each year can repay his or her salary to a district many times over.

Decisions To Be Made

* The Board of Education must join the energy management effort and support the administration.

* The total education family must realize that the comfort levels they grew up with are no longer realistic.

* All concerned must realize this is one of those areas where money must be spent to save money.

* The administration must have long range, reachable goals in mind. Unrealistic goals cause all concerned to feel their efforts are not working.

* All administrators must realize that this is a community effort, so community input is necessary.

Methods To Employ

* Repay campus sites for unused electricity or heating oil when compared to previous usage. This money may be added to their supply allotment.

* Establish district policies that dictate thermostat settings and light levels.

* Pursue energy audits (usually free) through local utility companies that recommend the places you can save money and point out those areas of the campus already in good shape.

* Pursue micro-processor control systems that remove the human element from the system. This is a large investment with usually large returns.

* Start a long range retrofitting program of the building envelope in order to insure a reduction in heating and cooling loss.

* Convince all architects/engineers to strongly consider energy conservation when designing buildings. It is better to spend current construction dollars than inflated energy dollars.

* Consider different types of high efficiency HVAC systems like heat pumps in lieu of standard types of systems.

* Consider totally turning off campus sites for several weeks a year when students are not on site.

CHANGING THE SCHOOL CALENDAR

TO EFFECT COMFORT AND ENERGY SAVINGS

As presented by:

Glenn H. Ashby, Ed.D.
Assistant Superintendent for Business
Creighton School District #14
Phoenix, AZ 85016
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ONE avenue that offers the possibility of significant energy conservation being investigated in several schools is changing the traditional school calendar. A study I conducted indicated that changing the school starting date, without shortening or lengthening the school year, could result in significant energy savings in the Southwestern United States by taking advantage of more favorable weather conditions. However, old habits die hard.

Because the educational reward (pay) system revolves around "getting more hours" or degrees, the school calendar at the local level is largely determined by the University calendar meshing with that of the local school district. The calendar trend in the Universities has been to start earlier which has resulted in increased energy costs in the Southwestern United States.

Experiments in altering the school calendar to take advantage of the local weather conditions include changing the length of the school day, varying starting and ending times of the school day, longer winter vacations, shorter winter vacations, a shorter school week and so on. The variations are many. However, the application of these changes are dependent on many factors including the legal framework that school districts operate under and the acceptance of change by the local community.

A long-term survey of the average cooling degree days or heating degree days in some sections of the United States and Canada could reveal weather patterns which would indicate changes in the school calendar. The study I conducted in Phoenix, Arizona, averaged the weekly cooling degree days for the months of May, June, August and September of a seven-year period. These weekly cooling degree day averages were then translated into full load cooling hours by weeks and months. From this data, energy demands were estimated for weekly amounts and five theoretical school calendars were compared for energy consumption. Temperatures and humidity indices were also calculated to determine which weeks were most comfortable. The ideal calendar, September 12 to June 12, approximately two weeks later than the regular school opening in Phoenix, for energy savings and comfort was developed from this information. School administrators must realize, and help legislators and others to realize, that there is nothing sacred about their traditional school calendar. The school calendar can be made to work for, not against, a school district budget.

MT. DIABLO ENERGY MANAGEMENT PROGRAM

SAVES $713,000 IN FIRST YEAR

As presented by:

Lauren Fickett
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THE Mt. Diablo Unified School District received statewide recognition for its energy management program which saved taxpayers $713,000 in one year as a direct result of implementing an energy management program.

Implementation of the program began with the hiring of two people -- one administrator and one teacher -- as Energy Managers to direct and coordinate the district's Energy Management Team. These energy managers organized and administered an Energy Management Committee composed of school building representatives, maintenance people, community and business representatives, representatives from the local utilities and representatives from the cities within the boundaries of the district.

Specifically, the district took the following steps to reduce energy consumption and save taxpayer dollars:

* Developed applications, applied for and received loan grants from the state and federal governments for energy conservation measures.

* Utilized the funds from these loans and grants to make modifications in individual buildings identified as having "major energy usage problems".

* Set an ambitious goal of reducing energy consumption in the district by 45 percent before the end of the second year of the program.

* Provided school buildings within the district with ongoing information regarding their energy consumption.

* Met with staff members and other groups throughout the district

to stress the concept of "the best controller of energy consumption is an aware individual".

* Provided ongoing, graphic information to the Board of Education so members were aware of the achievements of the Energy Management Team.

The Energy Managers met on an ongoing and regular basis with all head custodians, food service managers, administrative groups and as many faculty members as was possible. The focus of these meetings was to:

* Provide comparative data on energy consumption and utility usage from the base year (1979-80) and succeeding years (1980-81 and 1981-82).

* Orient those attending the meetings to energy saving approaches.

* Demonstrate the potential achievements of districtwide efforts.

The Energy Management Team provided ongoing reports to all administrative groups so they were always being appraised of the progress being made. Incentive grants that would return some of the money saved to individual school buildings were developed and an eye-catching logo was designed and used in disseminating all energy information.

The Energy Management Team worked cooperatively with the local utilities to conduct mini-energy audits on half of the school buildings in the district and worked with two energy management firms to complete a combined energy audit of technical systems analysis of all 13 buildings in the district.

Working closely with the maintenance department, the following steps were taken to reduce usage:

* Flourescent fixtures were replaced with energy-saving lamps;

* Water temperatures were lowered;

* Heating, ventilating and air-conditioning controls were installed;

* Time clocks were installed on boilers, pumps, heaters and lighting circuits;

* An extensive delamping program was carried out;

* A sequential program was organized to progressively replace incandescent lighting with flourescent lighting;

* A major effort was undertaken to reduce summer usage by turning off most energy consuming items and by making energy-saving modifications to swimming pools, gynmasiums, athletic

fields, parking lots and other areas.

* Installed programmable controllers and modified fan motors, compressors, outside air dampers, hot and cold deck settings and installed pilotless ignition systems; and,

* Using student (high school) help, replaced over the summer, standard flourescent tubes with energy-saving models. (The local utility reimbursed the district for 50 percent of the tube cost).

The accomparying sample is representative of the type of information the district's Energy Management Team distributes to the schools in the district.

ENERGY ADVISORY BOARD AGENDA

10/8/81

1. Review of committee charge - Lauren Fickett
2. Update on '80-'81 activities and results - Norm McRae & Ron Walters, Energy Managers
3. Projected utility pricing and conservation programs - Jackson Mueller, P.G.E.
4. Implications of Schools and Hospitals Federal Program, Cycle III, Grants, 1981-82 - Norm McRae
5. Plans for 1981-82 Energy Management Education - Ron Walters

RACINE UNIFIED SCHOOL DISTRICT

ENERGY CONSERVATION PROGRAM

As presented by:

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Assistant Superintendent
Business Services
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THE Racine Unified School District has been engaged in an energy conservation program for the last four years. This program has been successful in reducing the district's use of natural gas by 13 percent. Following is a list of things that were done to achieve this savings:

1) Energy audits were conducted on four schools. Selecting certain schools by age and type, we were able to use the recommendations from these audits on the 40 other schools in the district.

2) All fan controls in each school were equipped with electric seven-day timers. The timers were set so the fans would start one hour after the beginning of the school day and would turn off one hour before the end of the school day.

3) All temperatures were lowered to comply with the federal regulations.

4) Every thermostat and control device in the district is checked on a continuous basis to be sure they are calibrated correctly.

5) Skylights have been eliminated and/or covered. This has reduced vandalism, leaks and heat loss.

6) The amount of outside air taken into each building has been reduced to about 10 percent of design in most cases.

7) Weatherstripping has been installed on outside doors. Vestibules were built in some areas to decrease the amount of cold area entering some buildings.

8) Windows were covered or eliminated in areas where there was a large amount of glass. This was done primarily to reduce the amount of heat build-up during the Spring and Fall, and

to reduce heat loss in the winter. This also reduced the replacement of broken windows.(1)

9) All fluorescent bulbs and ballasts purchased for replacement purposes are the energy-saving type.

10) We have purchased and will be installing turbulators in our larger school boilers. This installation will slow down the flow of air within the boiler, thereby causing more heat to be transferred to the boiler water, increasing efficiency of the boiler and reducing the loss of energy normally experienced by high stack temperatures. Limited prior experience with these units indicates this is a satisfactory energy conservation measure.

11) We have purchased and will be installing steam misers in locations where steam traps need to be replaced. We have been advised that the installation of these units will reduce gas consumption in these buildings from 15 to 40 percent. We have no experience to date with these installations; time will tell.

Projects we will implement as financing becomes available include:

1) Continue to cover windows.

2) Install insulation in attics or as roofs are replaced.

3) Lower ceilings and lights.

4) Decrease the amount of foot-candles in some classrooms.

At one location there was a series of windows which were made like storm windows, fastened with a quarter-round moulding. A 1-3/4" insulated panel, which had aluminum on each side, was purchased. The window was removed and the panel installed in its place. After the panel was installed, it was painted to match the building. All windows in each classroom were covered in this manner, except for three small operable windows, which provided for outside ventilation.

In a number of locations buildings had very large wooden sash windows. These were all operable. At these locations, we screwed all the windows shut, except for two per classroom and caulked around the sash. On the inside, a 3/4" layer of styrofoam was fitted into the sash next to the glass. This styrofoam was then covered with a 1/4" layer of plywood or masonite. On the outside, a 3/8" layer of overlay plywood was installed and caulked. The inside masonite was

(1) Windows have been covered in different ways. The method used depended on the window design.

painted the same color as the walls, and the exterior the same color as the trim. Where buildings were two or three stories high, a truck with a bucket was rented so that the carpenters could install panels without using scaffolding. Panels were cut to size before installation.

MANAGING FACILITIES COSTS AND RESOURCES

AN ADMINISTRATOR'S GUIDE

TO SCHOOL MAINTENANCE AND OPERATIONS

As presented by:

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THIS presentation is an introduction and overview of a Handbook entitled "An Administrator's Guide to School Maintenance and Operations", developed for use in a training course for school business officials in the administration of school district maintenance and operations programs. This training program was jointly developed by the New York State Department of Education, the New York State School Business Officials and the State University of New York at Albany. The handbook, published by the New York State ASBO, is available at cost.

The handbook is divided into five sections, each section being subdivided into a series of related topics.

* The first section is devoted to the administrative aspects of maintenance and operations programs. The topics covered include: M & O policy development; the supervisor of M & O; professional staff development; budgeting and purchasing; forecasting; building utilization; and public relations.

* The second section is concerned with the operations of the school district. Its' principal topics include: cleanliness standards, inspection procedures, the grounds program, wage administration, special checks, emergency communications, staffing projections and contract cleaning.

* The third section covers maintenance procedures including the types of work performed, scheduling of maintenance, work order forms, preventative maintenance and maintenance staffing.

* The next section discusses the health, safety and energy conservation aspects of a school district maintenance and operations program. The safety section discusses federal and state guidelines for safety in school districts and OSHA concerns.

Energy conservation is given a comprehensive treatment. The final topic in this section is concerned with issues of warehousing, storage and security.

* The final section of the handbook covers personnel management of maintenance and operations staff in great detail. The topics include: the orientation of new employees, supervision, job descriptions, evaluation procedures, staff meetings, in-service training, personnel filing procedures and custodial substitutes.

This handbook provides a comprehensive overview of the administration of maintenance and operations programs of a school district. It is not a substitute for a detailed, descriptive text on the actual day-to-day procedures of a maintenance and operations program such as how to clean specific areas. The handbook is designed primarily for school business administrators and supervisors of maintenance and operations personnel.

The handbook is available from the New York State Association of School Business Officials, 119 Washington Avenue, Albany, New York, 12210. (143 pages; $15.00)

AN OVERVIEW OF RISK MANAGEMENT IN MAINTENANCE AND OPERATIONS

As presented by:

Keenan C. Glaser
Director, Loss Control Services
Insurance Company of North America
Central Region Office
Kalamazoo, MI 49001
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THE prime responsibility of anyone involved in risk management is the management of loss. Your school district faces loss from:

* Cost of insurance;
* Losses not covered by insurance;
* Deductibles applied to those losses that occur;
* Hidden cost of losses;
* Cost of controlling your hazards.

You can purchase insurance to cover almost every imaginable loss; you can spend less for your coverage by either not insuring an exposure or insuring it with a high deductible.

There are certain costs that are not ordinarily covered by insurance known as "hidden costs". For example, you suffer a fire which destroys a building. You suffer the hidden costs of transporting children to another building; paying overtime salaries to take care of the incidentals; and so on. Many authorities feel that these hidden costs are four times the insured cost.

Costs of controlling your exposures and hazards are the cost of guards, warning signs, training programs, burglar alarms and the like.

Can we cover maintenance losses by insurance? In many cases, the answer is yes. On major items that are damaged -- a roof collapse from the weight of snow or water -- there can be insurance coverage even if the roof is old and weakened with age. Wear and tear and damage to smaller items or equipment are usually never covered.

Your job then is to look at all your cost factors and make a choice: which alternative will cost the least? If your choice is other than full insurance coverage, then you must consider actions that will reduce or mitigate your exposures to loss (and even if you elect to cover your exposures with insurance, you will still want to control your losses because of the "hidden costs").

HOW DO YOU CONTROL/MITIGATE YOUR EXPOSURES?

* Through planned periodic inspections by trained individuals using thorough checklists.

* Through the development of "standard" procedures for all maintenance procedures. These maintenance procedures are then published and taught to all employees. All procedures should be checked periodically to make sure that they are being followed.

* Through the application of guards (handrails, barriers and other restricting devices), alarms or warning devices (burglar alarms, fire alarms, etc.).

* Through a thorough accident investigation program which provides for remedial actions and review.

We expect normal wear and tear to wear out buildings and equipment over a long period of time. Accidents (abnormal wear and tear) require special risk management techniques to control.

TEN MONEY-SAVINGS SUGGESTIONS

FOR YOUR M & O PROGRAM

As presented by:

Frank Barzilla
Director of Facilities and Planning
Clear Creek Independent School District
2301 E. Main
League City, TX 77573
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DOES your maintenance appetite exceed your pocketbook? Do you need to know how to save dollars out of an already limited budget? Some of the ways to save money and still maintain efficiency are common sense, while others need to be tried.

There are many items listed below that speak to ways our district has managed to save dollars. Although most of these you have either heard of or used before, some of them are the type you need to see results on before you can afford to try. All these below have been tried and have shown monetary results.

1) Hire competent professional tradesman in the various maintenance fields.

2) Do not contract out anything you can economically do yourself.

3) Educate your principals as to who performs what on your staff.

4) Use your journeymen to constantly train apprentice help for future use.

5) Use the maintenance department to train your head custodians to perform minor repairs.

6) Utilize vendors of custodial supplies to conduct free training seminars for custodial staff.

7) Utilize building principals heavily in supervision/evaluation role for their staffs. This saves considerable administrative time within the department and saves considerably on complaints.

8) Train head custodian on proper staff management and utilization.

9) Be involved in school design and renovation so standardization of many items can occur.

10) Convince administration that putting less expensive materials in buildings is a case of "you can pay me now or pay me later".

MANAGEMENT AND TRAINING:

KEY TO ENERGY CONSERVATION AND

LOWEST TOTAL FACILITIES COST

As presented by:

Merle F. Wratislaw
Vice President
Educational Facilities Management
Services
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FOLLOWING is a list of professional maintenance middle management advantages you can use in your school district:

1) A proven program of preventive and corrective maintenance tailored specifically for your school.

2) The reliable memory of a computerized program for timely preventive actions.

3) Accurate records, recalled periodically and as desired, from the computer assisted program.

4) Timely notification, from an expert corporate staff, of changes to national, state and local regulations. Then local compliance by onsite personnel to those changes.

5) Continuous research and amalgamation of the latest approved maintenance techniques.

6) Continuous monitoring and reporting of effectiveness to you.

7) Nationwide recruiting and selection of management personnel.

8) Accomplishment of preliminary energy audits.

9) Implementation of a fully developed operational energy

management program.

10) Practical energy conservation recommendations, implemented by onsite personnel responsible for results.

11) Experienced liaison with outside contractors for the school.

12) Clear, understandable presentation of results to officials and boards.

Continuous Managerial Training and increased effectiveness for the assigned staff in areas such as these:

* New devices and applications;

* Standard Operating Procedures;

* Energy management;

* Risk management;

* Latest safety programs;

* Supervision of outside contractors;

* Inventory control;

* Principles of handling men, money and materials;

* Latest regulatory actions and their implications; and

* Effective presentation of data and records for higher level decision making.

Continuous training of school employees in areas such as these:

* Energy management;

* Preventive maintenance;

* Corrective maintenance;

* Latest engineering methods;

* Job and institution identification;

* Supervision and leadership, and

* Safety.

REDIRECTING MAINTENANCE AND OPERATIONS RESOURCES

As presented by:

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IN an effort to redirect our maintenance and operations resources, a study committee was organized. The committee was composed of principals, business representatives, Board of Education members, Maintenance and Operations Department representatives and City and County representatives. The committee, working closely with the Maintenance and Operations Department, completed the study in one year. The direct results of this study are:

* Implemented changes that enhanced and improved operations.

* Improved the attitude of our "customers" (students, staff and others).

* Improved management leadership.

* Reduced vandalism.

Following is a list of specific changes implemented in our district over the last two years:

1) Reorganized the Maintenance and Operations Department with an increased emphasis on strengthening management. This included inservice meetings, change in the salary schedules, outside courses and inclusion of all classified management personnel as members of a districtwide management team.

2) Increased the amount of direct involvement of all management personnel in budget development and management processes.

3) Organized regular management staff meetings at all levels to promote staff input.

4) Initiated procedures for the direct involvement of the Supervisor of Custodial Services and the Supervisor of Landscaping in the evaluation of site head custodians and site landscape personnel.

5) Emphasized sending employees to school for inservice and

training where and when needed.

6) Established a processing system whereby all maintenance requests are handled directly by the Maintenance and Operations Department and all capital improvements must receive approval of the Assistant Superintendent, Business Service.

7) Developed an ongoing inservice training program for head custodians and site landscape personnel.

8) Increased focus on leadership at the foreman level with the emphasis being on quality as well as quantity of work being provided and labor-savings techniques and inservice training where needed.

9) Reached an agreement with receivers of service to take some action on all capital improvement requests.

10) Assembled all business services managers to participate (August) in developing Division and Departmental Goals and Objectives for the year, including timelines and responsible person(s).

11) Changed the work week for landscape personnel from five to seven days (Monday through Friday and Tuesday through Sunday) with two teams.

12) Implemented a program of low-level maintenance delegating low-level maintenance to head custodians and leadmen at local campuses.

13) Activated a deferred maintenance program including expenditures of $1 to $1.5 million each year involving state monies, local district money and land sale monies. This included roofing, floor covering, blacktop and heating systems.

14) Placed heavy focus on purchasing new labor-saving equipment and upgrading existing equipment.

15) Developed and implemented an apprenticeship program cooperatively with the local union and the state with apprentices in five different areas: electrical, carpentry, plumbing, painting and welding.

16) Formed a Security Committee which resulted in the development of a security patrol, trailers on site, installation of alarm systems, lights off at night and other measures to reduce vandalism.

17) Developed a procedure of sending out weekly Security Patrol reports to all administrators and police departments.

18) Established a District Safety Committee with a budget

which holds districtwide safety meetings for all shop teachers.

19) Established leadpersons at the intermediate school level to provide improved supervision at night.

20) Developed an inservice training program for all substitutes in cooperation with Adult Education.

21) Developed a close-working team relationship with the energy team in an effort to improve energy usage and equipment efficiency.

22) Established a monthly, updated backlog list.

23) Established a work order sheet that requires estimation of completion date.

24) Developed a school closure handbook containing procedures to be followed in the process of closing schools including placement of personnel, distribution of equipment, distribution of teacher items, relocation of portable classrooms, establishment of a moving crew, establishment of a school closure committee, storage requirements and so on.

MAINTENANCE AND OPERATIONS WORKSHOPS

IMPROVE EMPLOYEE UNDERSTANDING AND

DEVELOP PRIDE IN WORKMANSHIP

As presented by:

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Assistant Superintendent - Business
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DO you offer opportunities to involve your custodians in various types of inservice? How can they play a role in energy savings, plant security, general safety...? Simple instruction of routine procedures can enhance the beauty of school buildings and grounds. The first contact a student, parent and/or taxpayer has with a school is usually the appearance of the physical plant. Even before residents form an opinion as to the quality of staff and curriculum, they evaluate the school district on the general condition of the buildings and grounds. The most important ingredient of this first measurement is the maintenance and operations department. It is an integral part of our school family and, as such, should be afforded an opportunity to develop and

increase its skills. An effective school plant maintenance and operation department leads to pride in schools and a better learning environment for the students, staff and community.

How can we improve and upgrade the skills of our maintenance and operations staff? One way that has been successfully used in Nassau County, New York, is a two-day seminar and workshop for our maintenance and operations staff. This workshop, currently in its 20th year, is sponsored by the Nassau County Chapter of New York State ASBO in cooperation with the Association of Chief School Administrators and the Association of Superintendents of Buildings and Grounds. It is scheduled just after the conclusion of the school year. All school districts, colleges and universities in the metro New York area are invited to send as many participants as they wish.

Five different programs are conducted simultaneously, changing sessions every 50 minutes. Each program is set up to accommodate 125 to 150 participants. The programs are arranged to meet the individual and varied skills of the participants: grounds, general maintenance, general cleaning and so on. Personal programs are also offered such as CPR training, information on health insurance programs, Social Security and retirement. Experts from various local, county, state and federal agencies, as well as representatives from private corporations, are invited to conduct these programs.

Five 50-minute sessions, divided by a lunch break, are conducted on the first day, and three 50-minute sessions are held on the second day. The second day program also includes a time block set aside for exhibits to be viewed by the participants of the various types of equipment and supplies available to school districts for operation and maintenance uses. The conclusion of the two-day seminar is highlighted by an afternoon banquet and awards and door prizes donated by the exhibitors.

Each year a different school district is selected to host this workshop. Expenses are offset by the registration fees paid by the school districts and exhibitors in attendance. The host district is also given a $1,000 donation to its scholarship fund by the Nassau Chapter of NYASBO. The success of this workshop can be measured by the continued yearly increase in programs offered, number of participants, number of school districts represented and the number of exhibitors. Our program in June, 1980, offered 34 different programs, had 568 participants from 63 different school districts and universities, and had 67 different companies exhibiting their products.

A sample one day schedule of programs appears on the facing page:

SAMPLE ONE-DAY SCHEDULE

MAINTENANCE AND OPERATIONS WORKSHOP

TIME		GROUNDS	BUILDING MAINTENANCE	GENERAL CLEANING	
9:40 to 10:20	Operation Edith Auditorium	Maintenance of Athletic Fields and Lawns Room 143	Energy savings thru roof and flashing repairs Room 141	Lavatory cleaning techniques Room 123	Plant security tips Room 142
10:25 to 11:05	Inspections (Fire) and violations Auditorium	Snow & Ice techniques Snow plowing & Equipment Room 143	Energy Savings thru proper maintenance of filters & coils Room 141	Office cleaning techniques Room 123	Custodial & maintenace role in energy savings Room 142
11:10 to 11:50	Fire-matics alarms and procedures Auditorium	Proper use and care of equipment Room 143	Energy savings thru proper maintenance of pneumatic controls Room 141	Floor care and maintenance techniques Room 123	Custodian's role in painting and decorating Room 142
11:50 to 1:15	LUNCH				
TIME		HEAD CUSTODIAN MAINTENANCE	BUILDING MAINTENANCE	GENERAL CLEANING	
1:15 to 2:05	C.P.R. Auditorium	Maintenance of built-in equipment Room 143	Safety Work habits & First Aid Room 141	Proper Use & maintenance of locks, panic devices,etc. Room 123	Energy Savings thru proper glazing & caulking Room 142
2:10 to	C.P.R. Auditorium	Maintenance of portable equipment Room 143	First Aid Do' & Don'ts Room 141	Steam Trap maintenance and repair Room 123	Proper use, care & maintenance of Fire extinguishers Room 142

MANAGEMENT EVALUATION OF SUPPORT SERVICE OPERATIONS

As presented by:

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and
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TODAY'S spiraling costs and the growing demands by the public for tax relief makes it imperative that administrators analyze their support-service operations to make certain that such operations are cost-effective and productive. The Middle States/North Central Association of Colleges and Secondary Schools make academic appraisals. Why not professional assessment of support-service operations?

This type of analysis can be conducted as an in-house or self-study program or by an objective, outside professional consulting firm. The advantages to a school district of retaining a consultant are these:

1) A consultant has a professional background and expertise that is not likely to be found on a school district staff.

2) A professional consultant can bring objectivity to a productivity analysis.

3) A consultant can analyze and implement a program that might never be completed if it depended upon the time and interest of current school district staff.

4) Improvement in productivity and reduction in manpower costs can be identified early in a program because of the accelerated timeframe due to the presence of a consultant.

Factors to consider in retaining a consultant

1) Determine the "track sound" of the consultant. Check with the consulting firm's clients to find out whether the performance of the consultant matches the claims made in the

consultant's project proposals.

2) Establish the timeframe for the analysis and completion of the consultant's recommendations.

3) Make certain that the consultant will be "on site" during the implementation of his recommendations.

4) Ascertain the experience and competence of consultant personnel to be assigned to your school district analysis.

5) Make certain that the consultant's billing procedure is clearly understood. Avoid paying high overhead charges for a consulting firm's officers who are never on a project.

6) Develop benchmarks to measure effectiveness of the consultant's recommendations.

7) Cooperate with your consultant:

   * The school administrator must not expect the consultant to "go it alone".

   * Solutions to problems are not developed in a vacuum: A consultant needs district cooperation to achieve goals and desired results.

An analysis should determine the following:

1) The adequacy or inadequacy of present manpower available or needed.

2) Better control of maintenance operations.

3) An improvement in work methods and accountability for materials used.

4) Development of better scheduling procedures and records to assess work performance.

5) Establishment of flexible work assignments to meet changes in workload.

6) Reduction of clerical costs because of simplified and improved records.

The Analysis Format

Functions studied:

1) Custodial/housekeeping

2) Maintenance

3) Grounds

4) Food service

5) Transportation

6) Training programs

Objectives of analysis:

1) Assess present service levels

2) Review assignment practices

3) Study supervisory followup

4) Review management controls and reports

5) Assess work methods used

6) Assess training needs

7) Determine payroll costs

8) Evaluate materials and equipment used

Support Services Analysis Detail

Custodial/Housekeeping

1) Evaluate present work assignments for buildings on a daily or periodic basis.

2) Review adequacy of staffing.

3) Check equipment, chemicals and methods used.

4) Determine whether present cleaning levels are adequate for cost incurred.

Maintenance/Grounds

1) Evaluate all on-going systems and procedures relative to scheduling techniques employed.

2) Establish accountability status.

3) Determine organization structure and communication procedures.

4) Appraise level of service delivered in terms of operating cost-effectiveness.

5) Ascertain equipment and manpower utilization.

6) Analyze seasonal demand.

7) Determine preventive maintenance programming.

8) Check existing controls such as:

* Backlog reports;
* Present work assignments;
* Followup supervision;
* Categorization of workload by priorities and crafts; and
* Service request forms and procedures.

Food Service

1) Examine and evaluate menus.

2) Evaluate Type A service.

3) Study food costs.

4) Analyze commodity utilization.

5) Review warehouse procedures.

6) Review work assignment procedures.

7) Evaluate supervisory follow-up practices.

8) Are commodities properly used and staff productivity effective?

Transportation

1) Evaluate present scheduling of manpower.

2) Review adequacy of service delivered.

3) Study operations to determine cost-effectiveness.

4) Review effectiveness of maintenance programs for department.

5) Determine maintenance cost per vehicle and average operational cost by mile.

Training Programs

Evaluate supervisory training and work methods training

procedures to determine whether existing programs fully meet the district's needs.

YOUR DISTRICT'S COMMODITY INVESTMENT

As presented by:

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SHOULD equipment and facilities be permitted to deteriorate, or should they be treated as a capital investment -- the modern school district's most valuable commodity?

Schools should recognize that to meet their ever-changing energy needs and the challenges of the future, they too must change to survive. Those responsible for the operation of schools must identify goals and objectives, short and long range, to implement an effective plan. Good communication is necessary to make both the school board and the community aware of the value of this commodity.

We would like to share what has worked in our school district. Maybe some of the ideas will work for you.

An agressive training program for maintenance personnel was started in the 1978-79 school year. As a result, District 54 staff performs 90 percent of all pneumatic controls, boiler and air conditioning work including replacement of up to 35-ton compressors and rebuilding up to 60-ton compressors. Training has included rebuilding pumps, rebuilding air compressors and clock and burner adjustments. As a result, in the 1979-80 school year we experienced a 27 percent reduction in the amount of energy used. This reduced level was maintained for the 1980-81 school year.

A Parts Department has been added, which allows the school district to invest in the commodity of energy saving parts as well as others. Some controls that we bought 12 to 18 months ago now cost double, and more. We provide adequate tools, testing equipment and technical manuals; and we (our maintenance people) always do as much in-house work as possible. When using outside services, learn from the people performing the work

Experience has shown that we must be willing to pay a competitive wage to maintenance personnel to compete wtih private industry. And we must communicate our accomplishments to our Superintendent and school board to build morale.

Furthermore, we have set up Preventive Maintenance Systems that conserve energy and then maintain the systems to continue saving energy.

It is necessary to invest capital to produce a long range savings in often overlooked areas. One of these areas is roofing. Consider:

* Developing a roof repair maintenance team, even if part of the team is part-time summer help.

* Adding insulation to the roof whenever it is structurally possible when doing major roof work. With the new one-ply systems, it is possible to compensate for the possible added snow load by leaving the gravel off.

* Develop a five-year major roof repair plan to better plan, project costs and update annually.

Additional work done that has proven effective to conserve our costly commodity is as follows:

1) Cleaning air conditioning coils will increase cold temperature 10° to 20° and provide better efficiency.

2) Adjusting boiler burners regularly will assure maximum efficiency.

3) Using photo cells on outside lights so they come on automatically at dark and shut off at 2:00 a.m. with a timeclock.

4) Installing controls that sense outside temperatures to reduce boiler water temperatures. This produces savings and comfort in spring and fall when temperatures fluctuate.

BUILDING DESIGN AND MANAGEMENT

COMPLEXITY AND CONTRADICTION IN ENERGY MANAGEMENT

(OR HOW TO MAKE ENERGY MANAGEMENT MANAGEABLE)

As presented by:

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EIGHTY percent of the buildings that will be standing in the year 2000 are already standing today! With declining enrollments and the high cost of construction, the percentage for school buildings might be even higher. It is too late to relocate, reorient or rebuild these existing buildings. However, the lion's share of energy conservation must come through an increase in efficiency of these buildings.

We are just at the front end of many new and creative ideas that are emerging to solve these problems. A recent example is the suggestion that elevators be used as two-way ventilation pumps.

Inflation and energy costs will not allow you to wait until all the bugs have been resolved, so that a single program might be universally applied. The following items should be considered as a starting point for developing your own Energy Management Program.

The proper attitude for energy conservation among teachers, staff, students and maintenance personnel is an absolute must. Any ongoing program in energy management must include constant PR to promote the conservation ethic.

Regional effects should be kept in mind when evaluating suggestions by outsiders, since some of these might be totally inappropriate for your geographic area. In some locations, it is important to minimize the perimeter wall surface of a building in order to reduce heat loss. At the same time, roughly 50 percent of the energy consumed in buildings is in the lighting system. To maximize daylight, you would do the direct opposite and increase the perimeter wall surface. The proper approach for your geographic area becomes extremely complicated and frequently requires computer analysis.

Generally accepted comfort levels of the past decade have come

to be viewed as extravagant. In conjunction with developing the proper attitude for energy conservation, people must be educated to learn to accept a wider range of temperature variations inside buildings. Temperature is not the only comfort factor. Others include air movement, radiant temperature of surrounding spaces, humidity, activity of the occupants, clothing and other internal building loads.

When conducting a survey, you must make a completely objective analysis. For this, we would suggest an outside consultant who has no bias with regard to the people involved, nor to those responsible for energy waste.

Monitoring existing usage and future results is necessary to achieve established goals. Without monitoring, it is easy for everyone involved to lose sight of the purpose of the program.

The lowest cost conservation methods usually entail passive means. They also entail designing systems to accommodate average conditions, rather than trying to cover extremes in weather. This relates to the earlier comments on comfort level.

For more costly methods of conservation, life cycle cost analysis might be required to weigh benefit versus cost. The complexity of this issue is easily resolved through the use of existing computer analyses. A "first cost" savings can be tempting, but might not be practical when the following elements are considered:

a) Local Weather Data
b) Building Envelope Thermal Characteristics
c) System Operating Schedules
d) System Energy Consumption
e) Energy Cost and Probable Escalation
f) Maintenance Cost and Probable Escalation
g) System Life Cycle
h) Installed Cost
i) Mortgage Period
j) Mortgage and Equity Amount
k) Interest Rate
l) Method of Depreciation
m) Cost of Taxes and Probable Escalation
n) Cost of Insurance and Probable Escalation

DESIGN FOR ENERGY CONSERVATION

(GOOD BUILDING DESIGN CAN SAVE YOU ENERGY AND MONEY)

As presented by:

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THE best new schools being planned today may utilize only half as much energy as did the "careless" schools of the past. With energy costs continuing to rise, everyone is concerned about finding ways in both old and new buildings to reduce operating costs by planning and operating buildings which are more efficient.

PASSIVE SOLAR ENERGY DESIGN

"Passive" means simple straightforward design without use of mechanical-electrical devices. When considering solar energy design:

1) Begin with good site selection and proper orientation of building units. North and south facing windows make good sense, while west facing windows are a mistake.

2) Landscaping can help reduce energy costs. Evergreen trees on north and west sides of buildings protect them from cold winter winds (as farmers learned generations ago). Deciduous trees on south sides provide summer shade.

3) Earth berms can shelter and insulate walls. In the future, partially underground buildings will be more common, since the earth is relatively warm in winter and cool in summer.

4) Good insulation in walls and roofs (and insulated double glass) usually have attractive pay-back periods.

5) South facing windows with overhangs are most efficient in many climates, since the "eyebrows" keep out high summer sun, while allowing low winter sun to enter, naturally warming the interior.

NATURAL LIGHT AND NATURAL VENTILATION - REDISCOVERED RESOURCES

Florida has done a 180° turnabout by now encouraging schools to have operable windows (in dramatic contrast to the windowless schools of the recent past, which required full-time air conditioning). When the weather is good, natural ventilation is free and pleasant.

NEW KINDS OF MECHANICAL SYSTEMS

Air conditioning is now often designed for "heat recovery" which means that surplus heat generated during the day is stored in insulated underground water tanks and then that warm water is used at night when heat is needed.

Heat pumps are being refined. Ice storage is being developed to allow ice to be made at night when electric rates are low (thus reducing electric "demand charges"). We have learned how to reduce losses through fume hood and other exhaust fans. Dozens of such details add up to large energy savings.

ELECTRIC LIGHTING

Educators are re-evaluating the need for high lighting levels, saving lighting and air conditioning costs.

OPERATIONS AND MAINTENANCE

Good management produces savings. Fans, air conditioning and lights should be turned off when spaces are not being used. A computer automation system can help.

ACTIVE SOLAR ENERGY SYSTEMS

When all of the above design features (which are economically attractive) have been incorporated, then the more sophisticated high technology energy systems can be considered and evaluated meaningfully.

Flat plate solar collectors, usually on rooftops, are being used on dozens of schools in many parts of the United States. Windmills are interesting experiments. A fascinating possibility for the future, when photo-voltaic cells come down in price, is to incorporate such electricity-generating panels into school design. South-facing roofs and walls will be put to work to generate electric energy.

HOW WINDOWS WASTE ENERGY AND WAYS TO INSULATE YOUR WINDOWS

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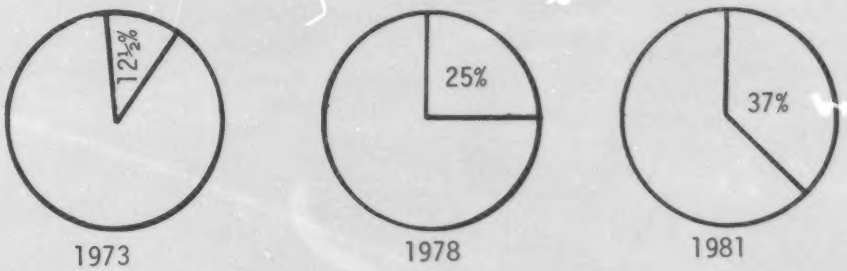
DOES your School's Discretionary Budget look something like this, with money spent on utilities consuming more and more of the discretionary budget each year?

A School's Discretionary Budget:

83% of the total school budget is spent on salaries and benefits, leaving 17% for discretionary purposes such as: books, athletics, special programs and Utility Bills.



1973 Discretionary Budget vs. 1978 vs. 1981

12½% Spent on Energy vs. 25% vs. 37%

Since the salary/benefit portion of the budget will not decrease, added fuel costs will have to be absorbed in the discretionary budget. That translates to fewer books, a reduction in special programs and cutbacks in music, the arts and sports programs. It should be evident now why energy conservation is such a high priority.

Are you aware that the single greatest energy waster in the building envelope is the windows.

This may sound surprising. If it does, I have to admit the wall and ceiling insulation manufacturers have been more successful than window manufacturers in pointing out different ways buildings waste energy.

Surprisingly enough heat does not always rise...heated air tends to rise, but heat itself travels in one direction...toward cold. It travels down through floors. It travels horizontally through walls and doors and windows; and it also travels up through ceilings. But it travels faster through windows than through floors or walls...or ceilings!

When it is 0°F outside and 75°F inside, ceilings loose heat at a rate of only 23 BTUs per hour per square foot. This compares to 105 BTUs per hour per square foot lost by windows. Windows waste energy almost five times as fast as ceilings.

Let us review definitions of some commonly used terms which should help you understand how windows waste energy. Here are three ways windows waste energy:

Conduction is what happens when heat travels through solid objects. In the case of a window, conduction occurs when heat travels from the warm inside air (or outside in summer), through the glass and frame, to the colder outside air (indoors in summer). Conduction is effected by the breezes or air currents moving across the glass surfaces.

Air Infiltration is just a fancy word for air leakage through cracks in walls, doors and window frames. It can let both warm inside air out and colder outside air in.

Radiation is a third way in which heat travels into and out of homes, though it is not often as significant as conduction or infiltration. Window panes, for example, can allow solar rays to pass indoors, countering winter "heat loss" to some degree, or aggravating summer "heat gain".

Some other definitions which should help you understand how windows waste energy are:

R Value - Resistance to heat loss due to conduction. The higher the R value, the greater the resistance to heat loss.

BTU - (British Thermal Unit) a measure of heat equal to the amount of heat energy given off by a single kitchen match.

U Value - (also denoted as U_c) Rate of heat loss due to conduction and the inverse of R (1/R). The unit of measure is BTUs /FT^2/HR/1°F. The lower the number, the more energy efficient the product is. The "U_c-Value" of a window or wall is measured by the number of BTU's that will pass through each square foot of area of the window or wall per hour, per degree of temperature difference from one side of the material to the

other.

U - Indicates the drop or reduction in the rate of heat loss due to construction modification. (Such as window wall insulation). This value is important since it directly relates to dollar savings (refer to Dollar savings Estimator).

Heating Degree Day (° day) - A ° day is counted for each degree below 65° reached by the average between the highest and lowest outside temperatures in the winter. For example, if on a given winter day, the daily average temperature is 30°, this is 35° below the base temperature of 65°; so on that day, you would have gone through 35 heating degree days. Add up all the heating days in a season accordingly and you have the degree day reading for that area. Some ° days are listed in the calculator.

Some non-capital expenditure ways to reduce heat loss through windows are to: weatherstrip and caulk windows...repair broken panes of glass...adjust sash balances allowing windows to close fully and close windows when rooms are not in use.

A new, cost-effective technology in insulating windows is now available. Whereas before the alternatives available to conserve energy through single glazed windows were to insulate them with storm windows or structural replacement windows, now there are products available on the market that are more cost-effective and offer greater energy savings.

One of the most cost effective ways to conserve energy is simply by reducing the glazing areas. Rather than a structural replacement of the glasing which might cost $15 to $20 per square foot, covering the glazing area with an insulated panel system suspended over the windows can be achieved at $3.50 to $5.00 per square foot.

Regardless of the system used to insulate, replace or reduce the glasing the cost effectiveness of the system must be evaluated. Two popular methods used to determine the cost effectiveness are:

$$\text{Simple Payback Method: } \frac{\text{Cost of System Installed}}{\text{Savings Per Year}}$$

$$\text{Return on Investment (ROI): } \frac{\text{Savings Per Year}}{\text{Cost of System Installed}}$$

A comparison of the paybacks or ROI should be done on any methods proposed before making a decision. However, without question, the cost of fuels will continue to rise. More and more of a school's discretionary budget will continue to be consumed by energy bills unless something is done immediately. As the commercial says, "Pay now, or pay later". If you pay later you will not achieve the savings now.

Energy Conservation is a top priority in our schools today!

THE BOTTOM LINE IN ENERGY SAVINGS

THE BUILDING ENVELOPE

As presented by:

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THERE is enough energy (BTUs) going through the roofs of buildings to heat and cool every structure in the United States. Because 99 percent of all buildings are insulated to precrisis standards, there are hardly any that perform efficiently. And, it is the roof where most energy is lost. The plain fact is that most of the energy used to create a comfortable environment "goes right through the roof". The chances are, you may be losing more energy through the roof than it takes to operate your entire facility. You can do something about it easily and inexpensively. The cost can actually be recovered quickly through lower utility bills.

You can put a feather in your hat -- and become an "energy hero" by following the steps necessary to properly reinsulate your district's buildings:

* Determine present BTU loss through the roof;

* Determine potential savings in dollars and payout;

* Go out for bids;

* Contract for the work; and

* Get ready for the applause.

Let's break these steps down, one at a time:

BTU Losses - The type and method of roof and insulation, construction and installation will determine the U Value (BTU loss) of a specific building's roof. Select an insulation supplier to help you develop technical information for this determination. Quiz him carefully as to expertise. You want a firm that readily knows the difference between a C Value and a K Value.

Potential Savings - Having selected a technical expert, he can suggest the U Value you should achieve for cost effectiveness

and project for you potential annual savings. This will allow you to determine the payback period when you determine the total cost of reinsulating a roof.

Bids - This is the most important part of the process. You must demand the potential contractor guarantee that his insulating system will perform, after it is installed, as he says it will, (easily checked by actual consumption) and that the firm further guarantees the vapor barrier performance. Six inches of fiberglass is R-19 but may only perform to R-7.6 depending on the installation. Any suggested system should have tested results (ASTM C--236 Guarded Hot Box). Do not consider someone's "idea" of a good method. Insulation can not be just placed somewhere to be effective. Insulation stuck on a false ceiling is easy and cheap, but the lack of performance makes it very expensive. Think of insulation like a gallon of gas. You may get 40 miles out of it (performance) or you may only get 6, it depends on how you use it. Often times, four inches of fiberglass insulation, properly installed, is better than eight inches improperly placed or installed.

Contractor - Let the contract go to the lowest respectable bidder who guarantees his work and give him plenty of time and room to do it properly. Check his neatness: installation is as important as the product. There can be no holes or cracks for energy or vapor leakage. Insulation must be sealed continually to be effective, do not let anyone tell you differently.

Applause - You bet! You will literally save thousands of dollars in direct heating/cooling costs. Your equipment will run less frequently, it will require much less maintenance and direct cost of running that equipment will be significantly reduced! Take a bow now -- you deserve it!

THE BACK TO BASICS OF ENERGY CONSERVATION

As presented by:

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THE energy crisis has created an extensive market for sophisticated and expensive equipment for school facilities, such as heat pumps and computer-operated energy control systems. However, this swell of technology tends to overlook many effective yet inexpensive energy saving ideas. Here are 12 ideas that can be helpful to your school district:

1) Set up an "energy committee" in your school district. Every building must be looked at on a systematic basis and an energy saving plan adopted. Include such people as principals, teachers, custodians and school patrons on these committees as well as students, but make certain that one person is designated the responsibility for followup on ideas evolving from the committee.

2) Maintain thermostat settings. Temperatures should be maintained at 65°F in the winter for high school students and 68°F for elementary. During the cooling season, settings should be maintained at 78°F. Adjustments to controls should only be made by authorized personnel.

3) Night-stat controls. Should be set to maintain heating temperature at 50°F after the regular school day, on weekends and on holidays. Exceptions to this guideline should be approved by the principal.

4) Cut back on intake of outside air. One study of 10 "representative" school districts found that the single most effective way to save energy was to take in and circulate less air.

5) Cut back on lighting. Lights should be reduced or eliminated in rooms with natural lighting. All lights should be turned off in offices, classrooms and non-instructional areas and

should remain off in unoccupied areas. Remove excess ballasts and fluorescent tubes (to meet state regulations) to reduce illumination to 50 fc in class areas, 30 fc in activity areas and 10 fc in corridors. Replacement tubes should all be low energy tubes. Gymnasium and parking lot lighting should be changed to high pressure sodium lights instead of incandescent.

6) Schedule classes to take maximum advantage of the sun's heat. Early morning sunshine will effectively heat areas with windows facing the sun reducing the need for heat from boilers.

7) Construct "sandwiches" of rigid insulation materials and place them inside exit doorways each night during cold weather. If possible, build and install double-door vestibules so insulation by "sandwich" method is unnecessary.

8) Install ceiling fans in the gym and auditorium to push hot air back down.

9) Check all buildings for cracks and other air leaks.

10) Draperies can be efficiently used to let heat in and keep it out as needed.

11) All windows should be checked for proper installation, glazing and tightness.

12) Hot water temperatures should be reduced to the 100-110°F range except in kitchens.

THE STATE OF THE ART IN SINGLE PLY ROOFING

As presented by:

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WITH the recent influx of new single-ply roofing materials and systems into the market, it has become increasingly important to understand what these systems and generic types of membrane can and cannot do as far as performance is concerned. The inclination to consider these materials as "all being the same" or to compare the systems by "square foot price" alone is totally misleading and unfair.

Various systems are available. One is our firm's GEOFLEX P.I.B.

(polyisobutylene).

Be sure that you're comparing apples and apples. If, for example, you are comparing a ballasted PVC and an unballasted P.I.B. -- apples and oranges.

Here are some definitions taken right from the National Bureau of Standards so that you may better understand exactly what a true elastomeric should be:

Elastomer -- material that at room temperature returns rapidly to its initial dimensions and shape after stress. Synthetic polymers with rubberlike properties - purpose of which - is to accommodate substrate and structural movement without failure.

Some roofing materials do not have this capability nor are they true elastomerics.

HOW TO MANAGE YOUR ROOFS

As presented by:

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THE first order of business in managing your roofs is to generate records. Most building owners have no records on roofs. Records must be maintained for each roof unit. A unit roof is any section of roofing that is separated by a parapet wall, a set-up wall or a major division within the structure.

Roofs have been built piecemeal, and therefore, roofs within the same building complex are of different age, vintage and design. An historical record of a built-up roof must include data on the kind of deck, the slope, the square footage, the type of built-up roofing and the type of aggregate surfacing. It must include the type of felts, the number of plies, the type of base sheet and a discussion on the installation that was provided. A detailed analysis of all flashings, types of flashings and counterflashings; the height of the counterflashings off the deck and the type of reglet, and so on must be included.

All roofs and flashing must be inspected semi-annually. The semi-annual report should note a roof unit's appearance, watertightness, immediate work required and so on. (Suggested sample historic record and inspection formats are available from ARMM

Consultants upon request.)

Roof Audits: A study should determine both short and long term maintenance programs, as well as long term roof replacement programs. Properly warned of a problem, a manager can plan to avert a financial disaster.

Roofing costs have escalated 20 percent a year every year since 1960. So, if a roof costs $5.00/square foot today, estimate that it will cost $6.00/square foot next year. Planning must start early.

Design: As a taxing authority, it is mandatory that you furnish detailed plans and specifications for the roofing work which you wish accomplished.

A building must be thoroughly analyzed to see if there is any structural contribution to the existing roof failure, any psychrometric contribution to the roof failure and a detailed analysis of top side contributions as to design, materials and workmanship, before beginning a redesign.

Bidders' Tour: A device wherein all potential bidders are invited to take a walk over the roof simultaneously with the designer to discuss the roof, the requirements of the plans and specifications, the areas that will be allowed to him for setup and any other pertinent information which will reduce the pain and suffering experienced by an owner having a roofer on-site. All questions are answered and any valid questions not covered by the plans and specs will then be covered immediately by an addendum.

Pre-construction Conference: A device which is conducted on the roof by the designer for the benefit of the award winning contractor and his foreman. This is the only guarantee an owner has that the foreman ever sees the plans and specifications. The foreman is taken through the requirements of the plans and specifications paragraph by paragraph so that he thoroughly understands what is required and what he must provide.

Contractors' Submittals: These paragraphs require submittals of samples of all materials to be used on the job, sketches of all metalwork that is to be provided and other information.

Roof Construction Monitors: A roof construction monitor on the site every day that the roofers are there is a major ingredient in guaranteeing to you that the product you contract to buy is being furnished. Cuts are taken daily before final surfacing and weighed on the job to determine compliance with specifications for materials, proper weights of interply bitumen, complete adherence of insulation to deck, membrane to insulation, surfacing to the membrane, no use of wet felts and so on.

The presence of a roofing monitor in no way relieves the contractor of his own quality control and/or safety procedures. The

monitor is not accountable to anyone for the contractor's means and methods. This is solely the contractor's responsibility. (A detailed list of the duties and responsibilities of a roofing monitor are available from ARMM Consultants upon request.)

Maintenance: Resaturants or roof coatings are only applicable to existing smooth roofs. An asphalt coating or mopping asphalt cannot stand solar load (exposure to ultraviolet) nor can it stand water emersion. Mopping asphalts must be protected from the sun by coatings.

Before a resaturant is considered, non-destructive testing should be made to determine how much of the existing insulation is wet.

ASBESTOS IDENTIFICATION AND REMOVAL

As presented by:

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ASBESTOS was once considered a health risk only for asbestos workers. Now asbestos is known to be a potential hazard to the health of millions of people, on and off the job, who are routinely exposed to asbestos fibers in the air they breathe. Among those whose health may be endangered by asbestos are children, teachers and others in schools where asbestos was sprayed or troweled on ceilings, rafters, beams and other structural building parts for fire-proofing, insulation, sound-deadening or decoration. This Information Bulletin discusses the asbestos hazard and what the U.S. Environmental Protection Agency (EPA) is doing to help safeguard public health from the risks of asbestos.

Asbestos -- What Is It? Asbestos is the common name for a group of natural minerals -- silicates -- that separate into thin but strong fibers. The fibers are chemically inert and heat resistant, and they cannot be destroyed or degraded easily. These characteristics have made asbestos very useful commercially. Asbestos is widely used for fire-proofing and insulating homes and all kinds of public and private buildings. Asbestos products include reinforced asbestos cement sheets and pipes, pipe insulation, roofing felt and shingles, floor tiles, patching and taping compounds and protective clothing. Some 800,000 tons of asbestos are mined or processed in the United States each year to make about 3,000 different products, two-thirds of which are used in the construction industry.

Why Is Asbestos A Problem? Unless it is completely sealed into a product, as in asbestos floor tile, asbestos can easily break into a dust of tiny fibers. These fibers, much smaller and more buoyant than ordinary dust particles, float almost indefinitely in the air and can easily be inhaled or swallowed. Once the fibers enter the body, they can cause a number of serious diseases:

* Asbestosis, a chronic disease of the lungs which makes breathing more and more difficult and can cause death.

* Cancer. Breathing asbestos fibers definitely can cause lung cancer. Also, since some of the asbestos fibers are rejected by the lungs, move up to the throat, and are swallowed, breathing asbestos can also cause cancer of the esophagus, stomach, intestines and rectum.

* Mesothelioma, a cancer of the membranes that line the chest and abdomen. Mesothelioma almost never occurs in people who have not been exposed to asbestos. It is always fatal.

Once asbestos gets into the body, it remains there indefinitely. It can move from the lungs to almost all other parts of the body, including the brain and the sex organs. Cancers can occur anywhere from 15 to 40 years after the first exposure. No safe limit or "threshold" of exposure is known. Any exposure to asbestos carries some risk to health, and people exposed to low levels of asbestos for a very brief period have later contracted mesothelioma. Finally, anyone exposed to asbestos who also smokes cigarettes has five times the chance of contracting lung cancer than a cigarette smoker who has not been exposed to asbestos.

What's The Government Doing About This Health Hazard? The Occupational Safety and Health Administration (OSHA) has established limits for worker exposure to asbestos on the job. The Food and Drug Administration is responsible for making sure that foods, drugs and cosmetics are not contaminated with asbestos. And the Consumer Products Safety Commission (CPSC) regulates asbestos in consumer products; it has already banned the use of asbestos in ceramic logs in gas-fired fireplaces, in consumer clothing and in drywall patching compounds. CPSC is studying the extent of asbestos use in all consumer products and is considering banning all non-essential uses of asbestos in consumer products that can release asbestos fibers.

Not all asbestos products are hazardous! Asbestos becomes a health hazard only when fibers are released into the air. This usually happens when the asbestos materials can be crumbled in the hand -- in technical language, when the asbestos material is "friable", as is asbestos insulation sprayed on a ceiling. In contrast, vinyl asbestos floor tile is not generally "friable". The asbestos fibers are firmly bound or sealed into the tile and can be released into the air only if the tile is cut, ground or sanded.

The EPA, which among other authorities can regulate air and water contamination by asbestos, prohibited the spraying of asbestos materials for fire-proofing and insulation in 1973, banned the use of asbestos that can crumble in pipe and boiler coverings in 1975, and prohibited virtually all uses of sprayed asbestos materials in 1978.

In addition, the EPA is investigating the cumulative effects on public health of exposure to asbestos -- from the time it is mined and milled, through processing and product manufacturing, use and disposal. And the EPA is also considering banning all non-essential uses of asbestos and asbestos products. The prohibitions being considered would be phased in over a period of time and would exempt certain essential uses for which reasonable substitutes do not exist and which do not pose an unreasonable risk to health. One example of the possible exemption from the ban: fire-protection suits for firemen if the asbestos is totally enclosed, sealed or bonded into the suit so that no asbestos fibers can be released into the air.

Under the Toxic Substances Control Act, EPA is required to ban or limit the use and disposal of any chemical substance that poses an unreasonable risk of injury to human health or the environment. Preliminary studies show that millions of people may indeed be facing the danger of unreasonable risk to their health from asbestos particles from an increasing number of sources. Thus the contemplated regulations to prevent and reduce unreasonable risks from asbestos.

What About Asbestos in Schools? Between 1940 and 1973, hundreds of thousands of tons of asbestos were sprayed or applied on ceiling and other parts of many schools -- and other buildings, public and private -- for fire-proofing, sound-deadening, insulation or decoration. Surveys indicate that 5 to 15 percent of the nation's public schools contain some asbestos materials. Some of the asbestos material is now known to be damaged or deteriorating -- and releasing asbestos fibers into the air in the buildings.

The fibers can remain suspended in the air for hours. And fibers that settle to the floor can be stirred up into the air again as children walk or run through halls, classrooms, the gymnasium, the cafeteria. Thus, while the asbestos fibers may be released only sporadically from damaged insulation on a ceiling or pipe, there can be virtually continuous exposure to asbestos. Indeed, in some schools, asbestos levels in the air have occasionally exceeded the federal safety standard for asbestos workers.

It seems likely that the dangers of asbestos exposure are particularly grave for children. Since they are exposed early in their lives, asbestos-induced cancers will have plenty of time to develop.

To safeguard the health of school children, teachers and others who work in schools, the EPA has launched a school asbestos program. The purposes of this program are: to identify school buildings that

contain asbestos materials, to inspect those buildings to see if asbestos fibers are being released into the air within the building, to remove or repair the damaged asbestos material and periodically to inspect the asbestos materials left in the schools.

EPA has prepared and made available to State and local governments and schools two manuals that explain, step by step, how asbestos problems can be identified and corrected.

The manuals -- called the Asbestos School Guidance Package -- are not just for public schools. Asbestos materials have been used in the construction or renovation of many private schools, colleges, universities and office, commercial and residential buildings. The package can help any building owner identify and eliminate asbestos hazards. It is available, free, by calling, toll-free, 800/424-9065. In the Washington, D.C. area, the number is 554-1404.

A videotape outlining the procedures explained in the manuals is available from EPA's 10 regional offices. And a specially trained EPA asbestos coordinator in each regional office can provide additional technical assistance.

EPA's school asbestos technical assistance program has been voluntary, and many State and local governments have participated in the program. However, to make sure that the necessary steps are taken to reduce the risk of asbestos exposure, EPA plans to issue regulations requiring that elementary and secondary schools be inspected for the presence of asbestos and requiring that asbestos exposure problems be corrected.

In sum, EPA's school asbestos program has already helped some schools identify and reduce asbestos hazards and, when the regulations are issued, will require other schools to do so too.

Meanwhile, students, parents, teachers and other concerned citizens can help rid the nation's schools of asbestos hazards by urging their school officials to take the necessary actions if they have not already done so.

Want More Information? Additional information on EPA's asbestos program is available from EPA headquarters in Washington, D.C. -- 800/424-9065 (554-1404 in the Washington area) -- or from EPA regional offices (see accompanying map and list).

Additional information on the effects of asbestos on health is available from Asbestos, National Cancer Institute, Bethesda, MD, 20205. (Call 800/638-6694; in Maryland, 800/492-6600)

Additional information on asbestos in consumer products is available from the Consumer Products Safety Commission. Call 800/638-8326; 800/492-8363 in Maryland; 800/638-8333 in Alaska, Hawaii, Puerto Rico, Virgin Islands.

EPA REGIONAL OFFICES

Region 1

Paul Heffernan
EPA
JFK Federal Building
Boston, MA 02203
(617) 223-0585

Region 2

Arnold Freiberger
EPA
Woodbridge Avenue
Edison, NJ 08837
(201) 321-6668

Region 3

Pauline Levin
EPA
Curtis Building
Sixth and Walnut Streets
Philadelphia, PA 19106
(215) 597-9859

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EPA
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Region 5

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Region 6

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Wolfgang Brandner
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Kansas City, MO 64106
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Region 8

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Region 9

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EDITOR'S NOTE: To provide current information, Mr. Brandner forwarded the following as this publication went to press.

Since my participation in the 67th Annual Meeting of the Association of School Business Officials in Kansas City, Missouri, some changes have been made in the Environmental Protection Agency's asbestos exposure control program. The following information is provided to bring you up to date and can be used along with the "Toxics Information Series - Asbestos" in your Tip Sheets and Gold Mine Packets or any other association publication.

On May 27, 1982, the Environmental Protection Agency (EPA) published a rule in the Federal Register (47 FR 23360-23389) requiring all public and private elementary and secondary schools in the United States to identify friable asbestos-containing materials, maintain records and notify employees of the location of the friable materials which contain asbestos. When friable asbestos-containing materials are found, schools must provide the employees with instructions on reducing exposure to asbestos, and notify the school's parent-teacher association.

Since 1979, the EPA has operated, and continues to conduct a Technical Assistance Program (TAP) to help schools identify and correct

potential hazards due to asbestos in schools. However, many schools did not respond to EPA's effort under the TAP. EPA is now requiring all schools to identify friable asbestos-containing materials and notify employees and parent-teacher organizations of their presence. These actions must be completed by June 28, 1983.

To assist schools in complying with the regulation, copies of the rule, EPA Forms 7730-1, 2 and 3 and "Asbestos-Containing Materials in School Buildings: A Guidance Document, Parts 1 and 2" are available from any EPA regional office. There is no longer any need to complete the "Asbestos Survey Report" in the Part 1 Guidance Document. Do not send any forms to EPA. The regulation requires only that schools create certain records and maintain them in their files. If EPA wishes to review these records, the Agency will request them from the school or examine them during a visit to the school.

The new regulations also apply to friable boiler and pipe wrapping, not just to ceiling and wall coatings or structural steel insulation. Since all boiler wrapping contains asbestos and much of the steam and hot water pipe wrapping in schools contains asbestos, schools may choose to utilize the exemption in 40 CFR 763.117(c)(1) on page 23376 of the May 27, 1982, Federal Register to save school district resources. This section exempts schools from inspecting, sampling and analyzing pipe and boiler wrapping if the schools will treat all such material in each building as containing asbestos. A statement to this effect needs to be in the school records and the employees and PTA so notified. If the exemption is not utilized, three samples would need to be collected from each boiler and from each pipe system in each school. Such sampling and analysis may be an unnecessary expense.

Asbestos insulation in pipes and boilers has been manufactured in several forms, including material having the appearance of bricks, mud or corrogated cardboard. Asbestos-containing pipe and boiler wrapping usually does not present an asbestos exposure hazard because the asbestos is enclosed within a canvas jacket. As long as this jacket remains intact and undamaged, asbestos fibers are not expected to be released. Do not cut open canvas pipe and boiler jackets for the purpose of collecting samples to comply with the regulation. An asbestos exposure situation would actually be created where none existed previously. Only damaged pipe and boiler insulation should be sampled or treated as asbestos-containing and repaired. If the damage is caused by unavoidable contact, a school may need to apply either a plastic or aluminum jacket over the repaired canvas covering. Repairs of this nature are minor in comparison to fiber release control measures for asbestos-containing ceiling and wall insulation.

The Regional Asbestos Coordinators can provide assistance on the need for implementing corrective action once asbestos has been found in a school, or offer advice on which abatement measures are appropriate in a particular situation.

CUSTODIAL AND HOUSEKEEPING PROGRAMS

SIMPLE GUIDELINES FOR GENERAL BUILDING MAINTENANCE

-STUFF YOU KNOW BUT MAY NOT REMEMBER-

As presented by:

Nancy R. Smith
Director of Educational Services
The McGuire & Shook Corporation
7440 North Shadeland Avenue
Indianapolis, IN 46250
Phone: 317/842-0000

I. Housekeeping Imperatives

- A. Develop concise outline of your housekeeping program

II. Classroom Maintenance

- A. General cleaning - Be systematic
- B. Chalkboards
  - 1. Types of chalkboards
  - 2. Erasers
  - 3. Chalk
- C. Floor Care
  - 1. Linoleum
  - 2. Carpet
- D. Lighting Fixtures
- E. Window Cleaning

III. Custodial Manual

- A. Need for a custodial manual
- B. Kinds of information to be included within a maintenance manual

A CONTRACTED CLEANING PROGRAM THAT WORKS

As presented by:

Larry T. Bock
Assistant Superintendent
Blair Community Schools
P.O. Box 288
Blair, NE 68008
Phone: 402/426-2610

Schedule of Work

Daily Service

1) Sweep inside and outside entranceways. Wet mop all inside entrance ways.

2) Sweep with a treated dust mop all tile and concrete floors.

3) Spot mop all tile and concrete floors to remove any spillage.

4) Clean, sanitize, service and restock all restrooms, using an approved germicidal cleaner to disinfect lavatories, toilets, urinals, partitions, fixtures, mirrors, towel and soap dispensers. Damp mop floor using a germicidal disinfectant.

5) Vacuum all carpet floors thoroughly and remove all spots and stains.

6) Floor to be spot mopped as needed.

7) Dust furniture and equipment; ledges, sills and hand rails.

8) Clean sanitize all drinking fountains.

9) Clean all classroom chalk boards and trays; clean erasers.

10) Clean, sanitize, service and restock all shower and locker rooms. Using an approved germicidal cleaner to disinfect all lavatories, toilets, urinals, partitions, fixtures, showers, mirrors, towel and soap dispensers, and shower and locker stalls and floors.

11) Dust all grills and spot wash walls.

12) Maintain floor traps free of odor at all times.

13) Disinfect cafeteria tables and chairs every night.

14) Sweep, scrub and disinfect kitchen floor.

15) Sweep shop area with a treated dust mop nightly.

16) Empty all pencil sharpeners nightly.

Weekly Service

1) Dust high and low areas.

2) Spray buff tile floors and spot wax where needed, preceded by wet mopping if needed.

3) Spot clean glass in trophy cases.

Monthly Service

1) Dust thoroughly all vertical and under surfaces.

2) Wash and disinfect all waste receptacles.

3) Dust, wash or vacuum clean all vents and grills.

Quarterly Service

1) Soap and water clean waste receptacles.

2) Sweep and dust all unoccupied areas.

3) Dust all light fixtures.

Semi-Annual Service

1) Scrub or strip all tile floors as needed and refinish and buff to a satisfactory finish.

2) Shampoo carpets as needed and lift pile after each shampoo.

Annual Service

1) Shampoo cloth upholstered furniture as needed.

2) Wash all light fixtures.

3) Reseal all concrete floors.

A sample agreement appears on the following page.

AGREEMENT

THIS AGREEMENT entered into this 9th day of June, 1981, by and between School District No. 1 of the City of Blair, Washington County, Nebraska, hereinafter called the owner, and Marsden Building Maintenance, hereinafter called the contractor, WITNESSETH:

Said contractor agrees to furnish custodial services to the owner at the Blair Junior-Senior High School, located at Blair, Nebraska, in accordance with the specifications hereto attached marked "Exhibit A," and by this reference made a part hereof. Said custodial service will begin on the 17th day of August, 1981, and will continue for a forty-four (44) week period through June 30, 1982, and will be performed at the rate attached hereto in "Exhibit B," and by this reference made a part hereof. This contract may be terminated by the owners upon giving a thirty day notice to the contractor, if in the opinion of the owner and its representatives, the custodial service fails to meet proper standards.

A weekly inspection will be made by a representative of both of said parties to insure quality job performance.

Said contractor will submit to owner regular bills which will be paid by the owner after the necessary processing of the claim through the district Board of Education.

It is understood and agreed that the relation of the contractor to the owner shall be that of an independent contractor and that said contractor shall have the entire charge, control and supervision of the work.

Said contractor will furnish to said owner a surety bond conditioned for the faithful performance of this contract and for payment of all persons performing labor under this contract, and furnishing materials in connection with this contract in the amount of $53,515.60.

It is further agreed that the contractor may furnish as many people as in its opinion, shall be necessary to perform the services covered in this contract and the contractor shall have the sole right to hire and fire any of its employees at its discretion, provided that the owner reserves the right to make reasonable objections to certain employees of contractor, and failure on the part of the contractor to remedy such objections within ten (10) days of notice shall be grounds for termination of this contract.

It is further agreed that the contractor shall provide trained, bonded personnel working under responsible supervision to perform the specified services.

It is further agreed that owner will not hire any employee of contractor used to perform services under this agreement and sixty (60) days after the termination thereof.

IN WITNESS WHEREOF, the contractor has caused this contract to be signed by its duly authorized representative and the owner has hereunto set his hand and seal, this 30thday of June, 1981.

SCHOOL DISTRICT NO. 1 OF THE CITY OF
BLAIR, WASHINGTON COUNTY, NEBRASKA
By _____

MARSDEN BUILDING MAINTENANCE CO.
By_____

"Exhibit A" referred to herein is the same as the "Exhibit A" dated April 17, 1980, and currently in the possession of both parties to this agreement.

PREMEASURED DETERGENTS:

A SYSTEM FOR OPERATIONAL CONTROL IN SCHOOL MAINTENANCE

As presented by:

Ron Karschnick
Regional Manager
Portion Pac Chemical Corporation
400 North Ashland Avenue
Chicago, IL 60622
Phone: 312/226-0400

THERE is a need for operational control in school maintenance programs. School boards are demanding justification of custodial service budgets and some are turning to outside consultants and contractors in an effort to control expenditures.

Traditionally, justification in this area has been very difficult. For over 75 years, schools have been buying their detergents once a year in the largest containers available -- usually 55 gallon drums weighing over 500 pounds each. These containers are difficult to receive in individual schools and can lead to tremendous product misuse.

Custodians are usually instructed to mix the detergent 10 to 1, 20 to 1, 50 to 1 or in some other strength. But it is the rare individual who knows how to use this kind of bulk product properly. As a result, most custodians use their best judgment and the "glug-glug" method of pouring "so much" into each bucket until it looks or smells right.

In contrast, individual portion control packaging of concentrated detergents provides you with an accountability tool to help standardize labor operations, project maintenance budgets and improve efficiency.

The custodian's job is simplified with such a system because each bucket of solution is mixed to do the same job every time. This eliminates both the under-use of solution (which wastes valuable and expensive labor time) and the over-use of solution (which causes accidental removal of floor finish and poor performance).

When individual portion control packages are used, inventory, quality and cost control benefits are improved.

Inventory Control. Product usage can be projected on a daily, weekly and monthly basis by computing how many packages are needed for each cleaning operation. It is therefore possible to accurately

determine the material needed for inventory in each school. This allows the projection of purchase requirements to ensure an adequate supply on hand with minimum investment in inventory and storage space.

Quality Control. Each employee can be issued the exact amount of material needed for daily or weekly assignments. If five rooms are to be cleaned, and one fresh bucket of solution is desired for each room, the total number of packages issued daily would be five. The system makes a custodian's job easier, since he will not waste time cleaning with dirty, ineffective or overstrength solutions.

Budget Control. By controlling solution changes with standardized procedures, costs can be assigned to every cleaning area. You will know where each package of detergent is being used and be able to break down cost data for each center and/or function. You can also forecast requirements for new buildings or different levels of cleaning.

All of this data can fit into your management reports. With it, you can present exact budget data showing where cleaning materials are being used. It will not only justify the cost of the material involved, but more importantly, it will justify labor by demonstrating that a department's procedures have been thoroughly programmed. Since cleaning supplies equal less than five percent of most school budgets, you can see that this advantage is of critical importance in getting the overall department budget approved.

How to Evaluate the Portion Control System in Your School. A simple 15-day feasibility study can give you all the data you will need to determine if the premeasured concept has benefits for your school. Here's how you might evaluate a portion control program on a management by objective basis:

1) Establish objectives. Determine what goals you want to achieve.

2) Select an area for a feasibility study. One floor, one building or one application (e.g., washroom maintenance) is ideal.

3) Determine the correct procedures to be followed and what size package is needed for your equipment.

4) Determine program usage, the number of solution changes needed to clean each area. The number of changes per employee will determine the number of portion control packages to be issued.

5) Set up your inventory control system.

6) Conduct your study.

7) Evaluate your results.

In order to obtain the product you want at the lowest possible cost, compare different size containers by their cost per usable gallon. In other words, what does it cost to make each gallon of ready-to use solution? (Remember that most bulk detergents are 90 percent water.)

Many manufacturers now publish their cost per usable gallon of solution. If they don't, it is easy to determine by dividing the cost per gallon or cost per package by the number of gallons of solution that it makes. By making this comparison, you will find that portion control detergents are rarely more expensive and may also provide substantial savings.

Always remember that labor costs are 90 percent of your maintenance budget, so the key to any cost effective program is to use labor effectively and justify the cost to your school board.

SPRAY BUFFING YOUR FLOORS CAN SAVE YOUR SCHOOL MONEY

As presented by:

Stan Thompson
Product Manager
Huntington Laboratories, Inc.
Huntington, IN 46750
Phone: 219/356-8100

CAN spray buffing your floors save your school money? Well, let's look at the facts.

When your custodial staff prepares to strip and recoat your floors, a number of tasks must be performed.

* Remove all furniture from the floor that is to be stripped.
* Dust mop all dirt and debris left on the floor.
* Strip the floor with a high alkaline stripper.
* Rinse the floor with water two to four times.
* Dry buff the floor with a red buff pad to close pores opened up in the floor due to the stripping action of the highly abrasive strip pads.
* Dust mop the floor with an untreated dust mop to remove any dust particles created by the dry buffing of the floor.
* Apply the floor polish to the floor (two to four coats).

Each of these tasks is difficult and time consuming, yet must be done from time to time. The key is how often they are done. Studies have shown that school district maintenance staffs strip floors at least once a year and recoat them a minimum of two times a year (summer vacation and holiday breaks -- Thanksgiving, Christmas, Easter, Spring Break).

With a proper floor maintenance program which includes spray buffing, the life of a school district's floors can be extended to two and sometimes three years. This frees custodial staff to do other jobs that may have been passed over yet need to be done.

Let's look at the steps necessary to spray buff a floor.

* Dust mop to remove dirt and debris from the floor.

* Using a trigger sprayer or spraying device attached to a floor machine, spray a fine mist of spray buff solution onto the floor.

* Buff this sprayed area with the floor machine equipped with a buff pad.

* Dust mop area to remove loose and surface soil particles.

In comparison to frequent stripping and recoating, spray buffing offers these advantages in floor maintenance:

* It's easier to do and therefore less tiring for maintenance personnel.

* Furniture does not have to be moved.

* Areas not subjected to high traffic need not be redone.

* Renews high gloss to floors without applying a new coat of finish.

* Removes scuff marks and black heel marks from floors.

* Requires fewer products.

How does spray buffing floors save money for a school district? Here are some of the ways:

* It extends the life of floor polish.

* It requires less maintenance time than frequent stripping and recoating.

* Reduces the amount of floor polish and stripper needed to adequately maintain floor.

COMPUTERIZED PROGRAMS

EFFECTIVE IMPLEMENTATION OF MONTHLY PREVENTIVE MAINTENANCE SCHEDULES THROUGH COMPUTER PRINT-OUTS

As presented by:

James E. Hendee
Director of Maintenance, Transporation,
Safety/Energy
Wilmette Public Schools, District 39
Wilmette, IL 60091
Phone: 312/256-2450

DOES your implementation of preventive maintenance schedules involve the director of maintenance, maintenance staff members, building head custodians and the building principal? Greater commitment by the personnel mentioned is forthcoming with greater involvement by each person. Direct contact and involvement from person to person increases through this process.

For example, a building head custodian must sit down with the building principal and go over (at least briefly) each monthly preventive maintenance print-out after servicing of each item has been completed and before the print-out is forwarded to the Director of Maintenance. In fact, this involvement includes the signature of the building principal on the print-out after consultation with the head custodian. This kind of procedure within the total implementation process produces more of the desired results. We are all interested in more thorough and better preventive maintenance. The process which includes more and better person to person contact and more involvement results in greater commitment by each individual. Ultimately this provides a more effective implementation of the program.

Utilization of computer print-outs will help improve preventive maintenance. However, when the total process includes procedures mentioned above the plan has even a better chance of a high degree of success. Helping the print-outs work for you does not require much additional time and effort.

ENERGY MANAGEMENT MONITORING SYSTEMS

As presented by:

Marcia B. Pederson
Manager
Arthur Young & Company
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SCHOOL business officials have in recent years, dealt with more energy related issues than any other district employee, including the facility engineer. They have paid the rapidly escalating utility bills, interviewed and retained energy audit contractors, purchased energy saving equipment, projected annual utility expenses for new budgets and more recently become accountable for the results of the energy related expenditures.

While the majority of their energy management responsibilities have been handled with ease, the task of analyzing and explaining energy use/cost variances was an almost impossible undertaking until the development of energy management monitoring systems.

ENERGY INFORMATION NEEDS

The decision by a school district to install an energy monitoring system requires first, that serious consideration be given to the question of the desired level of system complexity. Hastily made decisions regarding energy monitoring system selection and design all too often result in overly expensive and under utilized report data. The following paragraphs outline the scope of some of the most frequently utilized energy monitoring systems.

Energy Use/Cost Comparisons -- Monthly utility bill summaries are developed for each fuel type by facility to establish a history of energy performance. The current monthly data can be compared with that of the previous months' and year-to-date figures. The system thereby provides insight into the relative progress of the energy program's conservation efforts, seasonal and annual use/cost trends.

Variance Calculations -- To gain a truer understanding of an energy management program's progress or problems, the magnitude of the monthly utility bill variances may be desired. This information derived through several simple mathematical procedures, may be produced in the form of percentages, absolute dollars or energy units. If the variances appear to be material, action can be taken immediately to identify and correct the costly situation, or on the posi-

tive side, acknowledgement can be given to staff/students for a good energy conserving performance.

Variance Analysis -- Desiring insight into the probable causes of the calculated variances, beyond the surface investigation of the previous system, a methodology for analysis is required. A district must select a set of appropriate consumption variables against which to plot energy use, that is, square feet, student enrollment, hours of occupancy and so on. Any unusual fluctuations in the variables can help to describe the resulting energy use/cost variances. A system can be used initially to determine a reporting benchmark such as $/square foot or KWH/student and once established be used to sort out the energy consumption effects of otherwise "hidden" factors.

Energy Use/Cost Projections -- If a district wants to refine annual utility expense projections for budgetary purposes, a system of multiple regression equations may be generated utilizing a set of predictor variables. The variables, like those of the previous system, will consist of factors which directly effect energy consumption levels, but will incorporate normalized (two to ten years) data, to smooth out any irregularities of current year statistics.

TIME AND EXPENSE TRADE-OFFS

It is perhaps apparent in the descriptions of the energy monitoring systems above, that there is a direct correlation between a district's energy information output and the time and expense required for data input. When deciding which system format fits your present needs, it is essential that the practical requirements of time, expense and staffing skill level be researched.

A monthly spread sheet analysis may require only a few hours of a clerk's time, whereas, the multiple regression analyses would require the skills of an experienced mathematician. As complexity increases, many districts will opt for a computer solution, balancing the costs of the system against the expense of the time consuming manual techniques. If internal skills are not available or if the district does not have access to a computer, outside consulting services exist that can manage the system from start to finish.

ENERGY MANAGEMENT MONITORING SYSTEM BENEFITS

In summary, an energy monitoring system will assist your school district by:

* Monitoring an energy program's progress relative to a base year.

* Determining whether the anticipated energy use/cost savings resulting from personnel efforts and capital investments are being realized.

* Providing an "early warning signal" that an energy use/cost

problem has arisen at a specific facility.

* Supplying a school business official with a historical base from which to estimate future utility cost for projected budgets.

* Increasing energy management awareness and thereby, program participation among staff and students through the distribution of monitoring report feedback.

The institution of a practical and effective energy monitoring system is critical to the continued success of an energy management program. The effort involved in its development and utilization is minimal when compared to the potential benefits.

A UNIQUE ENERGY MANAGEMENT SYSTEM

THAT CENTRALLY LINKS MICROCOMPUTERS

BY RADIO FREQUENCY

As presented by:

W. Clark Britt
Assistant Superintendent for Support Services
DeKalb County School System
Tucker, GA 30084
Phone: 404/934-3610, Ext. 100-101

ARE your utility costs approaching or exceeding $5 million annually??? Do you want to reduce this bite into the instructional program by $1 million or more??? Sure you do -- we are all searching desperately to implement ways and means just to hold the line on rapid escalation of utility costs in our school programs.

AUTOMATED ENERGY MANAGEMENT SYSTEM CENTRALLY LINKING MICROCOMPUTERS BY RADIO FREQUENCY

In 1980, DeKalb County School System received a $580,165 grant from the Department of Energy with the understanding that these funds would be applied toward an automated energy management system. Since our radio security program operated very successfully for several years, an energy management system was designed to integrate the communications link for security and energy management on the same radio frequency.

An automated energy management system is now being installed in all DeKalb County Schools and is technically defined as a distributed computer system. The installation in each school electronically connects strategic points of control, distributing the computer control

strategy throughout each building complex to a remote terminal located near the existing radio security equipment. The remote terminal is, in fact, a self-contained microcomputer with broad capabilities. Each one is coupled by a radio link to central control computers located at the DeKalb County Schools Service Center for Energy Management and the DeKalb County Police Department for Security. The computer programming of this system has a distinct advantage in keeping the largest part of the systemwide microcomputers operating in the event of the central computer failure.

The energy management control strategy is primarily designed to control electrical demand, space temperatures, water temperatures, heating and cooling loads, external loads and ambient temperature override backup to protect equipment. Over 7,200 points are to be electronically controlled systemwide.

A yearly operational schedule is programmed for each school and can only be changed from central control. The Energy Administrator, following strict systemwide guidelines, makes final decisions on program alterations. The system is polled for priority HVAC alarms before school opens each day. If required to answer an alarm, maintenance personnel are dispatched immediately, usually arriving at a building before school begins.

The total cost of this system is approximately $2 million, including the Federal Grant portion for Energy Management. A conservative first year savings projection is 25 percent in utility consumption. The total payback period for the system is projected at two years of operation. An additional savings of approximately $75,000 will be realized annually by the use of radio frequency rather than leased telephone lines.

TECHNOLOGY HELPS A LARGE SCHOOL REDUCE SPACE/DISTANCE PROBLEMS RESULTING IN ENERGY & MANPOWER CONSERVATION, INTRUSION PROTECTION AND BUILDING STATUS INFORMATION

As presented by:

Ernest N. Rodbro
Director of Building & Grounds
Evanston Twp. High School, Dist. 202
Evanston, IL 60204
Phone: 312/492-3860

EVANSTON High School is a large urban school of approximately 1,027,000 sq. ft. of floor space in a complex of 28 buildings located just north of Chicago. The original buildings were built in 1922 with many additons through 1967 including a multitude of types of heating, ventilating and air conditioning: steam radiation, hot water convection, hot air, central ventilation, unit ventilation, unit heaters, absorption and direct expansion chillers and so on.

In order to start up and shut down approximately 40 systems (supply fans, return air fans, exhaust fans, circulating pumps, and the like) an engineer was required to walk approximately one and one-half miles, including flights of stairs and ladders. Start-up time was approximately two and one-half hours. As a result of these time/distance factors it was impossible to shut down the systems with optimum frequency and some systems were left to run continuously. With increasing energy costs, this method of operation became impractical and some means of remote control was a necessity.

The obvious solution was to install a form of multiplex communication rather than direct wiring because of the economies that could be effected due to the distances and large numbers of equipment requiring control. Since our electrical system is a 4160V primary distribution with 12 transformers, the use of an RF carrier current signal was ruled out and a twisted pair digital multiplex system installed. Further analysis indicated that it would be prudent to minimize control points so that each point generally controlled a system rather than pieces of operating equipment. While operating in the "occupied" mode, ventilation is shut down and night set-back temperatures of 55°F are maintained by steam radiation and hot water circulating pumps for convection. Hot air systems are likewise programmed to cycle

when the minimum night set-back temperatures are reached.

With these new night set-back conditions and our reliance on mechanical devices there was concern for the buildings especially during periods of prolonged holiday down time with potential sub-zero temperatures. Our security watchmen staff was limited so that complete surveillance for intrusion, fire, possible freeze-up in "cold spots", and other concerns was not adequate. This concern resulted in yet another use for our multiplex system: the addition of several low frequency intrusion alarm systems.

Critical building status information such as indications of minimum alarm conditions of "cold spot" temperatures, steam pressure, vacuum and control air pressures are reported on the annunciator of the alarm system panels which instruct the watchman to call in the building engineer when activated. Motion detection sensors are located in certain critical high security areas of the school and when a space is violated this is reported to the alarm system control panels. The school fire alarm annunciator panel is also tied into this reporting network through our multiplex system.

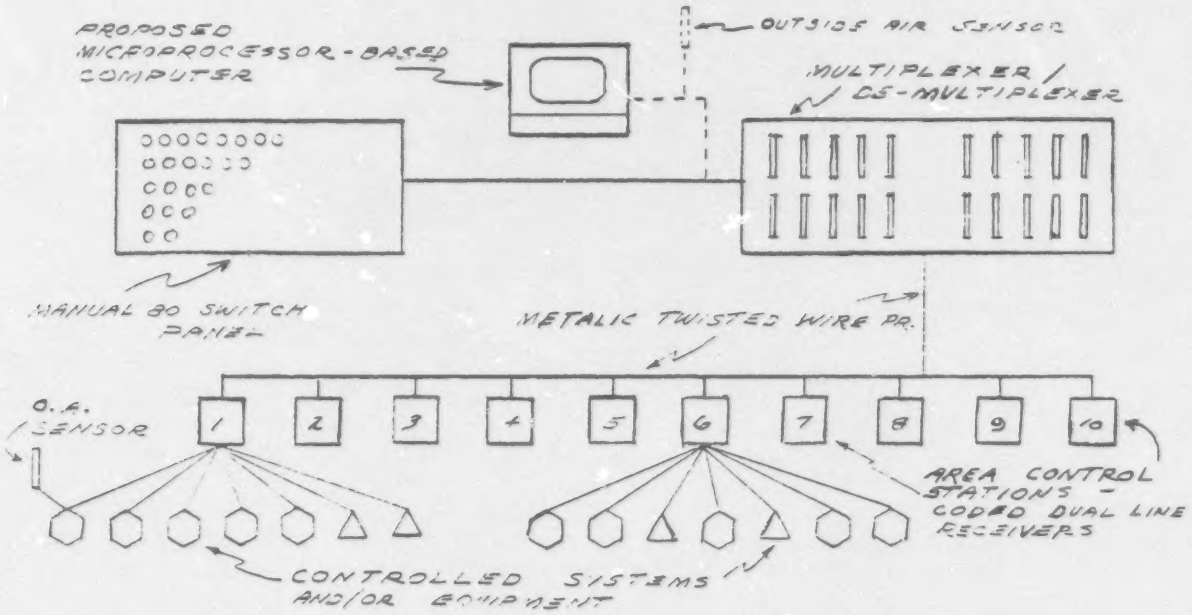
When any of the above events occur, a loud ringing power bell and telephone notifies the watchman over a 12 minute repeated tape recorded message which panel to inspect and what action to take. In the event the watchman does not take action within 12 minutes, the call is transferred to the home of the Chief of Security and advises him that the security staff has failed to respond. All of the alarm systems are turned on and off, by the watchman, through switches located at his station, via our multiplex system. To monitor the operation of the security alarm systems a miniature strip chart event recorder records the time of their on-off cycles.

Has the manual remote equipment control system reduced our energy costs? Analysis of utility bills for a nine year period revealed a 22 percent reduction in electrical consumption and a 41 percent reduction in gas consumption of which 26 percent is attributable to the multiplex system. Our "therms per degree-day" dropped from 242 to 144. The system cost was approximately $125,000 with first year combined energy cost savings of $144,300 for a simple pay back of 0.87 years. Our second fiscal year, 1980-81, the total energy cost savings were $210,700 with $142,800 attributable to the multiplex system.

The second phase, to be implemented in the near future, will be the installation of a micro-processor based computer control system to save additional electricity and steam consumption by using optimum start of equipment, duty cycling, load scheduling, electric demand monitoring and demand control via load shedding. The cost of this addition to the system will be approximately $33,000 with annual savings of $15,773 (based on 1981 capital costs and 1979-80 energy cost dollars) for a simple payback of 2.09 years. This HVAC computer control was one of our energy conservation measures submitted in a successful 50/50 federal grant application.

The application of present day technology has truly helped this large school in overcoming the handicap of space/distance/time operational problems with resulting economies and increased security.

REMOTE EQUIPMENT CONTROL SYSTEM SCHEMATIC



REMOTE EQUIPMENT CONTROL SYSTEM SCHEMATIC

E.M. Rodler

AN INTEGRATED SYSTEMS APPROACH TO TELECOMMUNICATIONS

SECURITY, ENERGY MANAGEMENT AND DATA TRANSMISSION

As presented by:

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School-of-the-Future Concept:

Integrated Systems Design: Incorporates a digital, computerized telecommunications system that provides both telephone and data transmission capabilities to more than 100 separate buildings. Integrates such services as voice, energy management, word processing, security monitoring and so on into one system, thereby eliminating duplicated facilities and costs. Utilizes micro-wave installations instead of costly leased lines.

Financial Considerations: Uses cumulative building funds to pay for project, thereby relieving operating funds from on-going and ever increasing costs. Projected to pay for itself in five (5) years from telephone and energy savings, the system will also permit the elimination of security service contracts at selected sites.

Improved Features: Centralized capture and recording of maintenance and long distance calling information; restricts toll calls to authorized personnel; plus other convenience features (e.g. call forwarding and transfer, automatic call back, conferencing and so on). Has the unique ability to provide least cost routing of calls and thus can react to future rate changes such as local measured service.

AN "APPLE" TO ANALYZE YOUR ENERGY BILLS

As presented by:

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THE degree of success one achieves in the conservation of energy is in proportion to ones ability to gather, organize and retrieve data in a suitable format. Administrators who had computer capability in the early 1970s had an advantage because of their ability to organize and update consumption records on a monthly basis and do the various calculations needed.

Today, that ability is available to most all school districts; for, with the advent of the microcomputers -- "Apples", "TRS-80's" and others -- most districts have computer ability to analyze their energy consumption and costs.

The following report formats show what is possible on an "Apple" - 48K - one disk system:

REPORT NO. 1: ELECTRICITY USAGE:

Electricity Report from September 78 thru April 79

Loc. No. = McPhee Mtr. No. = X131345 Pay Cycle = 2 Sq. Ft. = 32000

Sep-23-78 KWH 13440- **********
Oct-24-78 KWH 13680- **********
Nov-22-78 KWH 20880- **********
Dec-23-78 KWH 13680- **********
Jan-26-79 KWH 18240- **********
Feb-23-79 KWH 13920- **********
Mar-24-79 KWH 17040- **********
Apr-24-79 KWH 13920- **********
TOTAL USAGE = 124800 KWH MAXIMUM USAGE = 20880 ON NOV-78

REPORT NO. 2: ELECTRICITY COST:

Electricity Report from January 78 thru August 79

Loc. No. = McPhee Mtr. No. = X131345 Pay Cycle = 2 Sq. Ft. = 32000

Jan-28-78 $558.40- **********

Feb-27-78 $486.40- **********

Mar-25-78 $385.60- **********

Apr-26-78 $464.80- **********

May-25-78 $536.80- **********

Jun-24-78 $565.60- **********

Jul-26-78 $126.40- *********

Aug-24-78 $565.40- **********

TOTAL USAGE = $3689.40 MAXIMUM COST = $780.16 ON AUG-78

REPORT NO. 3 ELECTRICITY COMPUTATIONS ANALYSIS

Electricity Report from August 78 thru March 79

Loc. No. = McPhee Mtr. No. = X131345 Pay Cycle = 2 Sq. Ft. =32000

Date Read	Ending	KWH	Cost	KWH/1000	$$$/1000
Aug-24-78	3682	18720	565.40	585.00	17.67
Sep-23-78	3760	13440	407.20	420.00	12.73
Oct-24-78	3816	13680	414.40	427.50	12.95
Nov-22-78	3873	20880	630.40	652.50	19.70
Dec-23-78	3960	13680	455.44	427.50	14.23
Jan-26-79	4017	18240	605.92	570.00	18.93
Feb-23-79	4093	13920	463.36	435.00	14.48
Mar-24-79	4151	17040	566.32	532.50	17.69
Totals	**31352**	**129600**	**4108.44**	**4050.00**	**128.38**

REPORT NO. 4: ELECTRICITY USAGE AND COST BY MONTH 3 YEAR PERIOD

Cost and Usage Reports by Months for the Following Years

Electricity Report for Meter No. = X131345

	Costs			USAGE KWH		
	1979	1978	1977	1979	1978	1977
JAN	605.92	558.40	292.32	18240	18480	10080
FEB	463.36	486.40	344.06	13920	16080	13440
MAR	566.32	385.60	369.36	17040	12720	12960
APR	463.36	464.80	383.30	13920	15360	13680
MAY	439.60	536.80	551.30	13200	17760	19680
JUN	137.39	565.60	450.31	17280	18720	15360
JUL	138.74	126.40	238.24	4479	4080	8880
AUG	780.16	565.40	551.30	4549	18720	19680
SEP	605.92	407.20	450.50	18240	13440	16080
OCT	534.64	414.40	531.14	13440	13680	18240
NOV	598.00	630.40	531.14	16800	20880	18960
DEC	625.96	455.44	558.20	19440	13680	18480
Totals	**5959.37**	**5596.84**	**5251.17**	**170548**	**183600**	**185520**

Descriptions of various aspects of the system appear on the following page.

GENERAL DESCRIPTIONS

HARDWARE	DISK CAPACITY	INPUT NEEDED FOR METER FILE	
Apple II - 48 K - 1 Disk All written in Basic Disk 2.3 - and (+DOS 3.3 Basic)	50 meters for 36 months	Location Name: Meter No: Pay Cycle:	Usage: Cost:

ABILITIES: Add: Delete: Change: Sort on master meter file and usage files:

INPUT MONTHLY DATA	PRINT REPORTS	REPORTS	
By a meter By pay cycle By district In users sequence	By meter By pay cycle By district In users sequence	By meter By pay cycle By month Any three years	By District-By Month By District-Any Three Years

Unique Feature

PAY CYCLE:

When more than one utility meter exits it is likely that there will be more than one billing cycle. For example, all meters in the north section of the City may be read and billed on the first of the month and the south sector on the 15th of the month. The user of this program should code all meters by cycle.

FILE SEQUENCE:

Meter numbers - the key in the system, may not fall in the desired sequence. The user can issue, by use of the data revision routine, numbers in sequence and then sort file in that sequence.

Automatic entry sequence and reporting sequence are created by the above two features. The program will automatically retrieve the meters in sequences as given for the entirety of monthly data.

ENERGY CONSERVATION IN PUPIL TRANSPORTATION

COMPRESSED NATURAL GAS

A "HERE TODAY" SUBSTITUTE FOR GASOLINE

As presented by:

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GAS Service Energy Corporation, a wholly owned subsidiary of The Gas Service Company, is marketing all of the components that will enable the operator of a fleet of vehicles to use natural gas as an engine fuel. The components consist of vehicle conversion kits, natural gas compressors, fast fill reservoir assemblies and control panels and fill post assemblies.

COMPRESSED NATURAL GAS (CNG) VEHICLES

The subject of gasoline is currently one of the most hotly debated, least understood and emotional issues facing Americans. The price has escalated dramatically in recent years and availability in any amount is questionable. For many years we have looked at the problem of motor vehicle fuel and now we believe that the use of compressed natural gas (CNG) in motor vehicles represents an ideal solution at this time. The information which follows provides some generalized technical information on how we believe natural gas can be used for motor fuel purposes.

In addition to answering some technical questions, one must consider the practical, political and economic effects of a massive switch to natural gas powered vehicles.

Natural gas is clean burning and substantially reduces auto emission pollution far exceeding present EPA guideline objectives. CNG provides these advantages:

* Lowers fuel costs considerably

* Provides a second fuel system (even with CNG conversions, the operator retains the option of using gasoline as a fuel

* Offers an option to the effects of gasoline rationing

* Extends engine and exhaust system life because it is a cleaner burning fuel than gasoline and reduces vehicle exhaust emissions

* Reduces maintenance costs by increasing time and mileage between tuneups and oil changes

* Can be transferred from one vehicle to another with limited expense

* Decreases fuel loss from pilferage because it is a closed system

A number of questions have been asked whenever we discuss the subject of CNG vehicles, and we hope to answer some of these in the next few paragraphs.

How safe is the system? Very safe! Several characteristics of natural gas make it a safe vehicular fuel. It is lighter than air, and thus will dissipate into the atmosphere if a leak should occur, as opposed to liquid fuels which could "puddle" on the ground in the event of a collision and present a potential fire hazard. The ignition temperature of natural gas is approximately 1,200°F, or approximately 400°F to 500°F higher than that of gasoline or diesel fuels.

Our parent company has been using cars and trucks fueled with CNG for 10 years. At the end of 1980, it had nearly 325 vehicles operating on CNG. We believe that these vehicles are as safe, if not safer, than conventional gasoline powered vehicles. The possibility exists that in a severe collision, leakage of natural gas could occur in the valves or fuel lines. From all we are able to determine, we do not believe that this is a significant factor. In fact, we are aware of some tests which have been run which show that significant damage to a vehicle does not cause a corresponding damage to the CNG system.

What is the potential for use of CNG? We envision two markets that will use CNG: commuter vehicles and fleet operated vehicles. On the average, a commuter goes between 10 and 30 miles one way to work, or uses less than five gallons of gasoline a day. Fleet vehicles, on the other hand, travel between 70 and 100 miles per day and would use between six and nine gallons of gasoline each day. Initially, we envision the use of CNG would be by fleet operators.

What is the cost of CNG as compared to an equivalent gallon of gasoline? Presently, the cost of CNG as compared to a gallon of gasoline can range from 35 cents per gallon to approximately 85 cents per gallon. This equivalent cost is dependent upon the applicable cost of natural gas, the cost of electricity to drive the compressor, the cost of maintenance of the compressor and a road use tax similar to that paid on gasoline.

How many miles have CNG vehicles been driven? According to an American Gas Association report entitled, "Preliminary Analysis of the Safety History of Natural Gas-Fired Transportation Vehicles", December, 1979, fleet vehicles have traveled in excess of 175 million miles.

No deaths and only one injury occurred in which natural gas was a contributing factor.

PROPANE - ALTERNATE FUEL FOR SCHOOL BUSES

As presented by:

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WANT to save money on motor fuel? With the gasoline allocations and spot shortages of the 1970s, we began to look at what alternatives there were available. We were concerned about the continually spiraling price increase of gasoline and the possibility our supplier would have a short fall in terms of supplies. In 1979, we began to seriously consider propane. In October, 1979, we decided to try two buses converted to dual fuel. We were working with Suburban Propane of Kansas City.

CONVERSION OF FLEET

After a trial period of three months, it was decided to convert 20 additional units in order to have a more thorough trial and to get a broader base of experience. Storage and fueling facilities would be needed in addition to conversion kits. Accordingly, quotations on both fueling facilities and conversions were solicited from area suppliers. The current differential in the price of propane was about 40 cents per gallon below gasoline. The bid for an 18,000 gallon storage facility came in at about $25,000 and the bid for conversion kits for 20 buses was $18,000. Based on the price differential and the average number of annual miles per bus, it was estimated we would recover the entire $43,000 outlay in two years. In addition, since propane was not an allocated fuel, supply should be no problem.

Based on this experience, it was decided to convert a total of 45 units, all except the small buses and those soon to be traded in on new vehicles. Bids were solicited in the spring of 1981. Conversions were made for about $825 per bus. With gasoline prices still soaring, when we took bids on both gasoline and propane, we

found an amazing price differential of 67.2 cents per gallon. Gasoline was bid at $1.137 a gallon and propane was bid at $.465 per gallon. This revised our estimate to a two-fold recovery in just one year of the initial cost of the conversion.

EXPERIENCE AND OBSERVATIONS

1) Operations - There is about 10 percent reduction in miles per gallon. This is similar to reports in current articles in several magazines.

   - Drivers have no unusual problems.
   - Fueling is quick and easy (about 60 seconds).
   - No starting problems were encountered, even in sub-zero weather.

2) Legal Constraints - Those considering conversion should check on local and state constraints. Missouri follows The National Fire Protection Association Manual No. 58.

3) Availability - The main ingredient of propane is natural gas. the supply appears adequate well into the future.

4) Safety - If properly installed and handled, propane appears to be as safe as gasoline. However, because the public in general is unfamiliar with it as a motor fuel, questions seem to arise on this point.

5) Advantages - Lower cost is the number one advantage.

   - It is a closed system, hence there can be no pilfering.
   - Propane is a cleaner burning fuel than gasoline.
   - There is an abundant supply.

6) Disadvantages - It can't be "carried in a bucket" for emergencies.

   - A propane powered bus can't be refueled as easily on the road as a gasoline powered bus.
   - Mechanics have to learn a new system.
   - Propane is heavier than air; this should be taken into account in handling.

SAVING FUEL IN PUPIL TRANSPORTATION

As presented by:

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SCHOOL buses transport almost 21 million children to school each year in 283,000 buses using 360 million gallons of fuel. In 1974, the number of miles traveled by school buses exceeded the number traveled by all commercial buses for the first time.

While school bus fuel is a very small percentage of all of the motor vehicle fuel used in the United States, it represents an increasingly larger percentage of a school district's budget in a time when money is scarce.

By starting an active program to conserve school bus fuel, you can save money...help conserve dwindling petroleum supplies...and set the right example for your children and your community.

ENERGY MANAGEMENT

There are two types of energy which affect pupil transportation. Each plays an important role in the transportation of pupils.

The first type of energy has been making headlines since the 1973 oil embargo and everyone is aware of it -- fuel energy. This energy consists of fuels that are used to power school buses. It is obtained from precious fossil fuel resources which are being used at an increasing rate.

Since the 1973 energy crisis, many school transportation administrators have initiated efforts to reduce the amount of fuel required to operate their fleets. Rapidly escalating fuel prices and limited school budgets offer a strong incentive for reducing fuel use in every school fleet.

A second type of energy is just as important -- people energy -- the awesome energy exhibited by administrators, directors of pupil transportation, bus drivers, maintenance personnel and others, to commit to the making of an effective pupil transportation operation.

The energy of individuals was around long before the energy

crisis; furthermore, there is a surplus of it in every school district -- a surplus that can be used to implement actions to conserve fuel. This energy is important and should be harvested. Energy management consists of effective use of both types of energy.

HOW CAN PUPIL TRANSPORTATION COSTS BE REDUCED?

Each dollar spent for pupil transportation pays for salaries and benefits, fuel and oil, supplies, maintenance, equipment purchases, insurance and other needed items.

School transportation policies, purchasing practices, maintenance programs, vehicle use, school bus operations, driver skills, scheduling and routing are representative of areas that can be investigated to obtain more pupil-miles-per-gallon. Look at ways to increase fuel economy, reduce transportation costs and increase servicing efficiency. A cooperative fuel economy management program involving school administrators, staff, teachers, students and parents working with the transportation department can generally increase the effectiveness of every district's service to the community.